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SEED CERTIFICATION.

SUMMARY OF OPERATIONS FOR SEASON 1936–37.

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THE Seed Certification Scheme of the Department of Agriculture has now completed its tenth year of operations, and the following report conveys to readers the scope of the scheme during the 1936–37 season. Extensive amendments were made to the scheme of white-clover certification before the commencement of the season under review, while the wheat-certification scheme was subject to minor amendments. The list of crops under certification was not extended in the past season.

With the commencement of the 1936–37 season higher standards of purity for the machine-dressed seed of most of the grasses and clovers were insisted upon. In general no difficulty has been experienced in dressing seeds to the required standard. The exception to this was in the case of cocksfoot-seed, where without amendment of the previous season's standard, considerable difficulty was experienced in dressing lines satisfactorily.

A 13-per-cent. increase in the applications received for certification brought the total number for the 1936–37 season above the 3,500 mark. This increase was due largely to the reorganization of the white-clover scheme, supported in smaller measure by increases in the number of wheat and potato crops under certification. A reduction in the perennial rye-grass areas was sufficient to offset to a large extent the above-mentioned increases however.

GOVERNMENT STOCK SEEDS.

The Department combined its policy of producing supplies of certified "Government stock" seeds under contract in the past season, when 750 bushels of perennial rye-grass and 1,000 lb. of white clover raised from selected nucleus stock seed was readily disposed of through commercial channels. It was unfortunate in this respect that the perennial rye-grass-seed harvest was below average, as orders for this seed were more than double the quantity of seed available for distribution. One thousand pounds of cocksfoot seed of a strain selected by Lincoln College was also produced under the supervision of the certification organization and distributed by the College authorities for further seed-production.

PERENNIAL RYE-GRASS.

Applications for the certification of perennial rye-grass-seed were only 72 per cent. of the number received in the previous season,

the reduction being greatest in the number of areas eligible to produce "permanent pasture" seed. Average yields per acre were also low. These factors combined resulted in a reduction of well over 50 per cent. in the total quantity of seed certified, which amounted to under 130,000 bushels for the season. In addition, the germination-capacity of much of this seed was below normal, resulting in a general shortage in the supply of the certified product.

Included in the 22,500 bushels of mother seed certified is the produce of over 300 acres sown out with certified Government stock seed in the autumn of 1936. This acreage produced over 5,000 bushels of machine-dressed seed, all of which proved to be of high quality in regard to type.

Cocksfoot.

A slight reduction in the acreage of cocksfoot-seed entered for certification was recorded for the 1936–37 season, while a similar reduction was shown in the quantity of seed harvested. The Akaroa district has been responsible for these reductions, the acreage and quantity of seed harvested in mid-Canterbury (the only other district of importance) having increased quite appreciably.

Seasonal conditions, particularly on Banks Peninsula, were such as to mitigate the production of good-quality seed. Seed from the district mentioned was particularly light, and extreme difficulty was encountered in dressing the material to the quite reasonable standard required for certified seed, the main obstacle in this respect being the high percentage of kernel-less seeds present in many lines. This point is demonstrated by the fact that of 150,000 lb. of Akaroa-grown seed submitted for purity test after machine-dressing half this quantity failed to reach the necessary standard of purity.

The position in other districts was much easier, the percentage of rejections on purity being very little higher than in previous seasons.

White Clover.

Commencing with the 1936–37 season an entirely new procedure was adopted in the certification of white-clover seed. It having been proven that use could be made of a chemical test on seedlings to determine type of clover, the system of plot testing, field inspection, and paddock-branding was replaced by a system necessitating temporary sealing of machine-dressed seed pending the results of the chemical test on an officially drawn sample of the seed.

The result of this alteration has been a remarkable increase in the quantity of seed receiving recognition as certified seed. Whereas in the 1935–36 season 56,000 lb. of seed was accepted under the certification scheme, from January to September of 1937, 460,000 lb. of seed was tested and approved as certified. This quantity is greater than the total quantity of seed certified during the previous eight years from the inception of a scheme of certification covering white-clover seed.

Brown-top.

The certification of brown-top seed has now become relatively stabilized, fluctuations from year to year in the volume of the work undertaken being almost entirely attributable to seasonal variations. In the 1936–37 season 371,000 lb. of seed was finally sealed, this being a 75-per-cent. increase on the previous season's total. It is

estimated that at least three-fourths of the brown-top harvest receives the official endorsement of certification in each season.

Red Clover.

Once again the demand for certified Montgomery red clover has far exceeded the supply—this despite the fact that the quantity of machine-dressed seed certified in the 1936–37 season exceeded the previous season's production of 23,500 lb. by 20 per cent. Actually the acreage entered in the season under review was more than double that for the 1935–36 season, but yields of seed during 1936–37 reacted against a corresponding increase in the total amount of seed certified. That Montgomery red clover under certain conditions produces a heavy seed yield is evidenced by the fact that one area in Hawke's Bay in the past season returned a yield of over 600 lb. per acre.

Italian Rye-grass.

The acreage under Italian rye-grass certification has again shown a considerable increase, being 300 acres in excess of the 1935–36 season's figure of 378 acres.

The yield per acre of machine-dressed seed has fallen appreciably, but nevertheless over 12,000 bushels of seed were finally sealed and tagged as certified seed.

Phalaris tuberosa.

The certification of *Phalaris tuberosa* has not advanced in the way that might have been expected. Ten areas comprising 85 acres were entered for certification in the season 1936–37, but no area produced a satisfactory yield of seed, and from the 33 acres harvested 1,500 lb. of machine-dressed seed was obtained.

Seed Wheat.

The seed-wheat-certification scheme was subject to certain amendments prior to the commencement of the 1936–37 season. In the past many crops had been rejected at field inspection on the grounds that the sample of grain from these crops would not be satisfactory. It was decided to allow these crops to proceed to the grain-inspection stage, when an inspection of the grain sample itself would be the deciding factor in acceptance or rejection of the crop. This has caused a lower percentage of rejections in the field under the heading "general poor quality."

A second amendment was in the nature of a decision that only that wheat finally sealed and tagged after machine-dressing would be officially recognized as certified. This has resulted in a greater proportion of the accepted wheat being machine-dressed, giving to purchasers the benefits attached thereto, and at the same time eliminating an apparent weakness of the scheme that certified seed was not necessarily sealed and tagged.

General increases are again recorded in the scope of seed-wheat certification, acreages having increased by nearly 50 per cent. and the quantity of seed sealed and tagged having almost doubled.

It is of interest to note that the variety Cross 7 now holds pride of place in the quantities certified of the various varieties. Over 40 per cent.

of the 8,000 acres inspected was comprised of this variety, while, of the 47,500 bushels of seed machine-dressed, over 21,000 bushels was similarly comprised.

Seed Potatoes.

An increase of over two hundred entries for seed-potato certification was recorded for the 1936–37 season, bringing the total number of crops inspected for the season to 891. Of these, 20 per cent. were rejected for various reasons, while 80 per cent. were passed for certification purposes.

An extension of the scheme to cover crops entered from the Ohakune district was made at the commencement of the season, but apart from this the main development in the scheme has been in the Canterbury district.

The percentage of rejections is higher than has been the case for a couple of seasons. Particularly is this so in regard to crops rejected on account of the presence of foreign varieties beyond the maximum permissible percentage. In a proportion of cases this rejection has been occasioned by the admixture of varieties due to self-sown plants originating from a previous potato crop. In other cases the natural increase of the Northern Star variety, due to its tendency to produce large numbers of tubers, together with the fact that the owner of the crop has not given attention to the removal of plants of this variety, has led to rejection. It is quite established, however, that the question of foreign varieties can be controlled by the exercise of adequate care on the part of the farmer.

The Aucklander Short Top is still the main variety under certification and is in fact increasing in acreage at a more rapid rate than most other varieties. Next in order is the Dakota variety, while the recent introduction, Inverness Favourite, has risen to fifth in the order of importance in the course of three seasons.

In all, over 3,000 tons of seed potatoes were inspected after grading and accepted as finally certified seed. For the first time an appreciable export of certified seed took place, when approximately 300 tons of hand-picked seed was shipped to South America.

Brassica Crops.

Owing to a failure of the nucleus stocks, no rape-seed of the Broad Leaf Essex type was sown out to produce certified seed in the 1936–37 season. Three areas of the Giant type, comprising 30 acres, were harvested and produced 111 cwt. of seed, giving an average yield of 411 lb. per acre. All the seed produced was rapidly absorbed into commercial channels.

General.

The accompanying table gives the quantities of the various seeds certified since the inception of seed certification in 1927 and also shows the estimated value of the seed certified in each season.

It should be noted that this table includes only seed in a machine-dressed or graded condition, and does not include seed harvested but not submitted for machine-dressing, or (in the case of potatoes) tuber inspection.

Persons or firms interested in the complete tabulated results for the season may obtain copies on application to the Director of the Fields Division, Department of Agriculture, Wellington.

Table giving Quantities of each Seed certified and Estimate of the Total Value of Seed certified in each Season.

Seed.	Chief Consideration upon which Certification is based.	Quantities of Seed finally certified.									
		1927–28.	1928–29.	1929–30.	1930–31.	1931–32.	1932–33.	1933–34.	1934–35.	1935–36.	1936–37.
Potatoes	Varietal purity, cropping-power, and freedom from virus disease Tons	217	249	511	760	818	938	1,806	1,821	2,845	3,132
Wheat	Varietal purity and freedom from loose and stinking smuts Bush.	3,840	11,682	16,714	4,060*	1,283*	7,001	6,012	11,110	25,646	47,465
White clover ..	Age of pasture, 1928–31; type of clover, 1931–37 lb.	..	10,595	69,015	67,242	6,131*	33,731	20,337	93,381	56,092	460,930
Perennial rye-grass	Genuine perennial type .. .. Bush.	..	..	17,052	45,982	81,186	245,667	119,019	182,386	279,305	129,495
Brown-top ..	Freedom from red-top (*Agrostis palustris*) lb.	..	..	170,071	171,083	198,343	138,843	118,978	384,588	212,734	371,358
Cocksfoot ..	Type as exemplified in the produce of Akaroa Peninsula „	..	..	..	..	171,720	622,765	200,560	715,982	657,319	334,374
Red clover ..	Type conforming to that of English-grown Montgomery red clover „	..	..	..	..	1,550	3,763	17,263	32,193	23,620	28,140
Brassicas	Varietal purity and freedom from disease „	..	..	..	..	..	..	22,515	522	24,503	12,432
Italian rye-grass ..	A rapid-growing high-producing type, showing recovery after cutting Bush.	..	..	..	..	..	..	..	5,121	6,669	12,549
Phalaris tuberosa ..	Freedom from other species .. lb.	..	..	..	..	..	..	..	..	2,701	1,533
Estimated value of seeds finally certified		£2,070	£4,889	£30,328	£40,048	£57,358	£142,585	£79,018	£154,725	£184,501	£168,845

* Reductions accounted for by changes in regulations.

Total estimated value of seed certified (1927–37), £864,367.

LAMBING PERCENTAGES.

ESTIMATES FOR THE CURRENT SEASON.

THE following are the estimates of the current season's lambing in New Zealand, computed from estimated average percentages furnished by Inspectors of Stock :—

NORTH ISLAND.

County.	Breeding-ewes.	Estimated Percentage of Lambs.	Estimated Number of Lambs.
AUCKLAND DISTRICT.			
Mongonui	31,033	79	24,516
Whangaroa	13,251	80	10,601
Bay of Islands	57,814	86	49,720
Hokianga	54,267	81	43,956
Whangarei	100,038	82	82,031
Otamatea	68,258	82	55,972
Hobson	69,419	83	57,618
Rodney	68,005	75	51,004
Great Barrier Island	7,188	67	4,816
Waitemata	66,158	89	58,881
Eden	2,020	85	1,717
Manukau	54,689	96	52,501
Franklin	95,631	96	91,806
Coromandel	41,918	78	32,696
Thames	10,922	97	10,594
Hauraki Plains	9,110	95	8,654
Ohinemuri	10,456	89	9,306
Waikato	85,811	96	82,379
Raglan	258,023	87	224,480
Waipa	132,659	104	137,965
Piako	96,220	100	96,220
Matamata	135,066	100	135,066
Rotorua	46,199	91	42,042
Taupo	6,662	90	5,996
Taumarunui	84,118	89	74,865
Kawhia	49,484	88	43,546
Otorohanga	92,758	95	88,120
Waitomo	253,834	95	241,142
Ohura	92,244	89	82,097
Kaitieke	53,094	82	43,537
Tauranga	52,395	92	48,203
Whakatane	32,442	84	27,251
Opotiki	50,216	86	43,186
District totals	2,281,402	90·404	2,062,484
GISBORNE - HAWKE'S BAY DISTRICT.			
Matakaoa	66,775	83	55,423
Waiapu	252,693	71	179,412
Uawa	123,626	80	98,901
Cook	455,323	82	373,365
Waikohu	358,761	81	290,596
Wairoa	376,038	81	304,591
Hawke's Bay	912,238	70	638,567
Waipawa	346,534	77	266,831
Waipukurau	123,177	89	109,628
Patangata	476,022	75	357,016
Weber	53,863	82	44,168
Dannevirke	235,318	94	221,199
Woodville	69,271	90	62,344
Pahiatua	142,841	93	132,842
Akitio	155,950	92	143,474
District totals	4,148,430	79·026	3,278,357

LAMBING PERCENTAGES—*continued.*

NORTH ISLAND—*continued.*

County.	Breeding-ewes.	Estimated Percentage of Lambs.	Estimated Number of Lambs.
WELLINGTON DISTRICT.			
Clifton	57,078	92	52,512
Taranaki	18,864	99	18,675
Inglewood	35,969	98	35,249
Egmont	19,238	107	20,585
Stratford	61,415	92	56,502
Whangamomona	46,896	90	42,206
Eltham	45,450	95	43,177
Hawera	67,884	104	70,599
Waimate West	5,491	102	5,601
Patea	196,715	96	188,846
Waitotara	139,918	95	132,922
Waimarino	155,637	87	135,404
Wanganui	282,452	91	266,031
Rangitikei	919,546	93	855,178
Oroua	203,862	107	218,133
Kairanga	106,355	96	102,221
Kiwitea	214,800	100	214,800
Pohangina	111,537	97	108,191
Manawatu	140,574	91	127,922
Horowhenua	114,052	95	108,349
Hutt	74,377	82	60,989
Makara	47,502	73	34,676
Featherston	325,944	89	290,090
Wairarapa South	165,273	89	147,093
Masterton	333,570	80	266,856
Castlepoint	97,694	81	79,132
Eketahuna	109,833	81	88,965
Mauriceville	42,630	80	34,104
District totals	4,140,556	91·896	3,805,008
NORTH ISLAND DISTRICTS.			
Auckland	2,281,402	90·404	2,062,484
Gisborne-Hawke's Bay	4,148,430	79·026	3,278,357
Wellington	4,140,556	91·896	3,805,008
Totals, North Island	10,570,388	86·523	9,145,849

COMPARISONS WITH PREVIOUS YEARS.

The following table shows the estimates for the current season's lambing in the North Island, together with the figures for the five previous years. The actual number of lambs tailed is also given.

Year.	Number of Breeding-ewes.	Estimated Average Percentage of Lambing.	Estimated Number of Lambs.	Actual Number of Lambs tailed.
1937	10,570,388	86·52	9,145,849	..
1936	10,300,826	90·50	9,322,476	9,423,240
1935	9,697,231	83·68	8,114,361	8,500,075
1934	9,524,065	88·70	8,447,643	8,555,477
1933	9,318,943	91·23	8,502,050	8,385,569
1932	9,170,996	89·16	8,177,657	7,988,569

LAMBING PERCENTAGES—*continued.*

SOUTH ISLAND.

County.	Breeding-ewes.	Estimated Percentage of Lambs.	Estimated Number of Lambs.
MARLBOROUGH-NELSON-WESTLAND DISTRICT.			
Waimea	167,487	74	123,940
Takaka	26,187	69	18,069
Collingwood	12,772	82	10,473
Buller	2,901	94	2,727
Inangahua	11,284	93	10,494
Murchison	33,118	78	25,832
Grey	24,732	107	26,463
Westland	35,302	102	36,008
Sounds	103,681	73	75,687
Marlborough	192,694	76	146,447
Awatere	207,210	82	169,912
District totals	817,368	79·040	646,052
CANTERBURY–KAIKOURA DISTRICT.			
Kaikoura	113,122	86	97,285
Amuri	228,471	72	164,499
Cheviot	141,185	89	125,655
Waipara	293,468	87	255,317
Ashley	65,368	84	54,909
Kowai	67,225	96	64,536
Oxford	82,881	100	82,881
Rangiora	42,383	93	39,416
Eyre	58,050	100	58,050
Tawera	56,473	71	40,096
Malvern	134,973	104	140,330
Paparua	35,428	105	37,199
Waimairi	4,965	94	4,667
Heathcote	9,510	89	8,464
Akaroa	95,676	107	102,373
Mount Herbert	41,641	99	41,225
Wairewa	73,571	104	76,514
Halswell	14,880	100	14,880
Springs	28,050	101	28,331
Ellesmere	90,046	92	82,842
Selwyn	166,785	81	135,096
Ashburton	758,496	97	735,741
Geraldine	244,225	84	205,149
Levels	162,968	112	182,524
Mackenzie	320,165	86	275,342
Waimate	459,621	96	441,236
Chatham Islands	43,779	73	31,959
District totals	3,833,405	91·994	3,526,516
OTAGO DISTRICT.			
Waitaki	451,873	94	424,761
Maniototo	252,958	91	230,192
Vincent	257,184	84	216,035
Waihemo	106,061	83	88,031
Waikouaiti	67,727	91	61,632
Taieri	167,092	86	143,699
Peninsula	12,924	98	12,666
Clutha	354,145	98	347,062

LAMBING PERCENTAGES—*continued.*

SOUTH ISLAND—*continued.*

County.	Breeding-ewes.	Estimated Percentage of Lambs.	Estimated Number of Lambs.
OTAGO DISTRICT—*continued.*			
Tuapeka	310,562	94	291,923
Bruce	204,523	91	186,116
Lake	131,849	76	100,205
Southland	1,293,029	100	1,293,029
Wallace	499,405	87	434,482
Stewart Island	1,584	80	1,267
District totals	4,110,916	93·193	3,831,100
SOUTH ISLAND DISTRICTS.			
Canterbury	3,833,405	91·994	3,526,516
Marlborough	817,368	79·040	646,052
Otago	4,110,916	93·193	3,831,100
Totals, South Island ..	8,761,689	91·348	8,003,668

The following table shows the estimates for the current season's lambing in the North and South Islands, and also the totals for the Dominion, together with the figures for the five previous years. The actual number of lambs tailed is also given.

Year.	Number of Breeding-ewes.	Estimated Average Percentage of Lambing.	Estimated Number of Lambs.	Actual Number of Lambs tailed.
NORTH ISLAND.				
1937 ..	10,570,388	86·52	9,145,849	..
1936 ..	10,300,826	90·50	9,322,476	9,423,240
1935 ..	9,697,231	83·68	8,114,361	8,500,075
1934 ..	9,524,065	88·70	8,447,643	8,555,477
1933 ..	9,318,943	91·23	8,502,050	8,385,569
1932 ..	9,170,996	89·16	8,177,657	7,988,569
SOUTH ISLAND.				
1937 ..	8,761,689	91·35	8,003,668	..
1936 ..	8,368,135	90·10	7,539,576	7,442,781
1935 ..	8,115,186	89·45	7,259,281	7,196,542
1934 ..	8,047,361	89·88	7,232,750	7,134,015
1933 ..	7,890,756	88·14	6,955,252	6,889,128
1932 ..	7,892,064	88·42	6,978,494	7,027,059
DOMINION.				
1937 ..	19,332,077	88·71	17,149,517	..
1936 ..	18,668,961	90·32	16,862,052	16,866,021
1935 ..	17,812,417	86·31	15,373,642	15,696,617
1934 ..	17,571,426	89·24	15,680,393	15,689,492
1933 ..	17,209,697	89·82	15,457,302	15,274,697
1932 ..	17,063,060	88·82	15,156,151	15,015,628

DISTRICT ESTIMATES.

The following table gives estimates of the current (1937) season's lambing for the several sheep districts in the Dominion :—

District.	Number of Breeding-ewes.	Estimated Average Percentage of Lambing.	Estimated Number of Lambs.
Auckland..	2,281,402	90·404	2,062,484
Gisborne - Hawke's Bay ..	4,148,430	79·026	3,278,357
Wellington - West Coast ..	4,140,556	91·896	3,805,008
Marlborough-Nelson-Westland	817,368	79·040	646,052
Canterbury-Kaikoura ..	3,833,405	91·994	3,526,516
Otago (including Southland)	4,110,916	93·193	3,831,100
Dominion	19,332,077	88·711	17,149,517

PACKING APPLES AND PEARS IN STANDARD CASES.

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II.

(Continued from p. 273.)

As with all operations in the packing-shed, careful arrangements should be made to facilitate the work of packing and avoid unnecessary labour. With this object in view the bottom of the bin of sized and graded fruit, and the bottom of the box into which it is to be packed, should be at least 2 ft. 6 in. from the floor, so the box may be packed without stooping. Such details improve the pack and increase the output.

The box to be packed is placed in a sloping position on a special stand which allows the bottom bulge to be built in as packing proceeds. A tray of wrapping-paper, glazed side up, and held in position by a "paper needle," is provided on the packing-stand, so that it may be readily reached by the left hand of the packer. With the help of a rubber finger-stall on the middle finger on the left hand, the packer takes a wrapping-paper and at the same time an apple with the right hand. He tosses the apple into the middle of the paper, and with the right hand brings up the lower half of the paper to cover the apple. He then turns the palm of the left hand down, and the right hand up with a half-twisting movement on the covered apple between them, and places the apple in the box.

POSITION OF APPLES.

The position of the apples in the box is now to be considered. They are not placed at random, but in a systematic manner, varying slightly, but not in principle, according to the size and shape of the fruit. The system is known as the "pocket" pack, as each apple lies between, instead of directly on, those below. This gives the pack elasticity, prevents bruising, and enables the packer to finish the pack at the right height, which obviously is the most important feature. No case of apples should be nailed down unless the pack is right in that respect.

Pack 2–1.

Rows, 5–4
Layers, 3.
Count, 41.

Rows, 5–5.
Layers, 3.
Count, 45.

Pack 2–2.

Rows, 6–6.
Layers, 4.
Count, 96.

Rows, 5–5.
Layers, 4.
Count, 80.

FIG. 7. SHOWING SOME OF THE COUNTS IN THE 2–1 AND 2–2 PACKS WHEN PROPERLY PACKED.

With the box in a sloping position and end on to the packer, if apples measuring 4 in. in diameter from cheek to cheek are wrapped and one placed in each of the lower corners, it will be found there is not sufficient room for the third apple to be placed between them in such a way that it touches the box-end, which is only 11½ in. across. It has to stand an inch or so off the box-end and project some distance in front of the two corner apples, leaving a "pocket" on each side. The fourth apple is placed in the pocket in front of number one, and the fifth apple in front of number two. If the sixth is then placed in front, or above, number three, we again have two pockets which should be filled, and the arrangement continued until the bottom layer is completed. With rather flat apples the number in the rows lengthwise of the case may be five in each; but with a more conical apple it may be 5–4—that is, 5 in each of the outside rows and 4 in the middle row. *The main axis of the apple—that is, the line from stem to calyx—should always be kept parallel with the length of the case, the stem of the fruit always pointing from the packer, except the last apples placed in the layer, which should be reversed, so that the stem-end is turned towards the packer, to avoid stem-punctures.* This pack is known as the *2–1 pack;* by adding these numbers together we get 3, which is the number of layers required to fill the case. The second layer is commenced by placing an apple in the space or pocket formed by the first three apples in the bottom layer.

With rather a smaller apple, say, 3¾ in. diameter, the three apples would lie snugly side by side against the end of the case, but that would make a "straight" pack instead of the more desirable "diagonal" or pocket pack. In this instance one apple should be placed in the left-hand bottom corner and the second half-way between it and the right-hand corner. By placing the third and fourth apples in the spaces between, number two is made secure in its position, and the layer is completed with apples in the same relative positions. This is known as a *2–2 pack,* and adding the numbers we get 4, which is the number of layers required to fill the case. The second layer is commenced by placing two apples above the spaces in the first layer.

Medium-sized apples, of about 2¾ in. diameter, four of which lie loosely along the end of a case, but without room for a fifth, make what is known as a *3–2 pack*—that is, a wrapped apple is placed in each corner and one in the middle of the end of the case; the fourth and fifth apples lie in the two spaces between, thus making three pockets or spaces which are filled, and the layer completed with fruits in the same relative position. It takes five layers to fill the box in this way, the second layer being commenced by placing two apples above the two spaces in the bottom layer, next the lower end of the box.

Apples with a diameter of 2¼ in. to 2½ in. are packed by the following method: One is placed in the left-hand bottom corner of the box and two more are placed equidistant in the remaining space, so there are three spaces or pockets for the next row. The layer is then completed with apples in the same relative position. This is known as the *3–3 pack,* and six layers will be required to fill the

Pack 3–2.

Rows, 6–5.	Rows, 6–6.
Layers, 5.	Layers, 5.
Count, 138.	Count, 150.

Pack 3–3.

Rows, 6–5.	Rows, 5–5.
Layers, 6.	Layers, 6.
Count, 198.	Count, 180.

FIG. 8. SHOWING SOME OF THE COUNTS IN THE 3–2 AND 3–3 PACKS.

case. As before stated, all *apples should lie on the cheek with the stem pointing directly from the packer, except the last row in a layer, which should be reversed.*

The following apple packs are generally most suitable for the standard bushel case :—

Packing Chart for Standard Apple Case.

Style of Pack (Crosswise).	Number in Rows (Lengthwise).	Number of Layers (Depth).	Size or Count.	Approximate Sizes.
				In.
2–1	4–4	3	36	4
2–1	5–4	3	41	4
2–2	3–3	4	48	3⅞
2–2	4–3	4	56	3¾
2–2	4–4	4	64	3⅝
2–2	5–4	4	72	3½
2–2	5–5	4	80	3⅜
2–2	6–5	4*	88	3¼
3–2	4–3	5†	88	3¼
2–2	6–6	4*	96	3
3–2	4–4	5	100	3
3–2	5–4	5	113	2⅞
3–2	5–5	5	125	2¾
3–2	6–5	5	138	2¾
3–2	6–6	5	150	2⅝
3–3	5–4	6†	162	2⅝
3–2	7–6	5	163	2⅝
3–2	7–7	5‡	175	2½
3–3	5–5	6§	180	2½
3–3	6–5	6	198	2⅜
3–3	6–6	6	216	2⅜
3–3	7–6	6	234	2¼
3–3	7–7	6	252	2¼
3–3	8–7	6	270	2⅛

* For flat apples. † For long apples. ‡ Flat apples only. § All apples.

In all minimum packs no fruit should be smaller than the size indicated for the packs in this chart.

Meeting the Buyer.

The buyer naturally expects to receive a full case of fruit in good condition. To comply with this specification the packer should finish the case with a smooth surface on the top layer of fruit, the centre being approximately 1½ in. above the edge of the box and the ends about ¼ in. for tight packs and ½ in. for looser packs. These measurements will depend to some extent on the strength of the packer and the tightness of the packing, but when nailed down the pack should be solid, without bruising, with a ¾ in. bulge at the centre, top, and bottom.

The height of the finished surface of fruit in a packed box depends on selecting the correct pack and the size of the pockets. The latter should be carefully adjusted when placing the first layer in the case; and pressing the second layer well into them will retain the size set. The larger-sized apples in each pack, such as the 48 count in the 2–2 pack, and the 100 count in the 3–2 pack, and the 180 count in the 3–3 pack, should be placed rather loose in the bottom layer or the pack

will finish too high and crush when lidded. This is probably the most common cause of a bruised pack. Not only should the bottom layer be loose, but the fruit towards the ends of the case should be looser than that across the centre. If the second layer is then well pressed down, the correct size of the pockets will be maintained and the top will finish at the right height with the requisite bulge. The smaller apples in each pack, however, such as 234 count in the 3–3 pack and 163 count in the 3–2 pack, should be packed tight in order to bring them up sufficiently high at the finish. *Care must always be taken to adjust*

FIG. 9. WITH THE AID OF THE LIDDING-PRESS AND WIRING-MACHINE THE PACK IS COMPLETED.

the size of the pockets when placing the first layer of fruit in the box. When two-thirds of that layer is in position the fruit should be pulled down firmly towards the packer without throwing the apples out of alignment ; this will close up the pockets somewhat across the centre and provide the necessary bulge if the second layer is pressed well down into the pockets of the first layer in order to retain the size set for the pockets. With loose packs especially there is a tendency for the fruits in the first layer to be closer together at the lower end of the case. If this is not rectified before the second layer is commenced it will be found when the case is filled that the fruit will be higher at the end nearest the packer than at the other end.

Stamping, Nailing-down, and Wiring.

So soon as a case is packed the packer's card should be inserted and the case then placed on the conveyer—which should be of one of the types illustrated, so that the bottom bulge is protected—where it reaches the nailing-down press. Where packer's cards are not in use it is the standard practice for the packer to mark the count per case in pencil at the bottom right-hand corner of the case. Care, however, should be taken to apply this neatly and legibly for the guidance of the nailer-down. There the box is examined to see that it is sound and all the nails are properly driven, the fruit is packed with a smooth finish, at the right height, and the packer's card is then filed.

The variety, count, and other necessary details which have not been overprinted on the label are then stamped on the case neatly with rubber stamps and indelible ink. The all-round corrugated pad if in use is now folded over tightly to avoid bulging at the sides, if a single pad is used it is placed squarely on, the two-piece lids and cleats are adjusted and held in position by the lidding-press and securely fastened with four nails each end through the cleats into the ends of the case. In doing this the operator, with his hands on the centre of the lid, exerts a pressure as the arms of the press come into operation, which has the effect of distributing the pressure equally through the pack and consolidating it evenly. The box is then released from the press, and, if it is to be exported, it is tightly strapped with wire, applied not more than an inch from each end of the box, and then placed on its side in a stack not more than six cases high awaiting shipment. Soaking cleats in water assists in overcoming splitting during nailing.

Harvesting the Pear Crop.

Mistakes are commonly made in judging the maturity of pears; possibly because they are judged on the same standard as apples, whereas their behaviour is somewhat different. Ripened on the tree they are of inferior quality, but picked so soon as they are mature, and ripened in a warm, humid atmosphere, the flavour and aroma develop to a maximum extent and the most is made of any qualities of that kind they possess. Experience is necessary for acquiring good judgment as to maturity; probably the most important sign is when the fruit parts from the tree in an easy natural manner when the weight is taken in one's hand and the fruit slightly raised. This behaviour, together with the size of the fruit and the season of the year, are the most useful indicators. Change in the colour of the skin is usually very slight at that stage; a colour-change, however slight, should usually be regarded as an urgent sign for harvesting pears. The harvesting of pears commences towards the end of January. The recognized commercial varieties are ready for picking according to the purpose for which they are required in approximately the following order: Commencing with William's Bon Chretien and Beurré d'Amanlis in the month of January; Louise Bonne de Jersey, Beurré Capiaumont, Beurré Clairgeau, Marie Louise, Beurré Bosc, Conference, Doyenné du Comice, Beurré d'Anjou, Packham's Triumph, Winter Cole, Beurré Diel, Vicar of Winkfield,

Duchesse d'Angoulême, Joséphine de Malines, Glou Morçeau, Giblin's Nelis, Winter Nelis, Keiffer, Beurré Easter, L'Inconnue, and P. Barry—the latter reaching maturity during the month of April.

The class of land and locality in which pears are grown, amount of crop per tree, and weather conditions prevailing during the season are factors which considerably affect the maturing of pears.

Packing Pears in the Standard Case.

Making and Labelling the Boxes.—The standard pear-case differs in size from the standard apple-case in depth only, and is known as the three-quarter pear-case.

The following are the dimensions of the standard pear-case:—

Inside measurement: $8\frac{1}{2}$ in. by $11\frac{1}{2}$ in. by 18 in.

Ends: $8\frac{1}{2}$ in. by $11\frac{1}{2}$ in. by $\frac{3}{4}$ in. or $\frac{5}{8}$ in. (two pieces each planed on the outer side).

Sides: $8\frac{1}{2}$ in. by $19\frac{1}{2}$ in. by $\frac{5}{16}$ in. (two pieces, one board for each side).

Tops and Bottoms: $5\frac{1}{2}$ in. by $19\frac{1}{2}$ in. by $\frac{3}{16}$ in. (four pieces, two each top and bottom).

Cleats: $11\frac{1}{2}$ in. by $\frac{3}{4}$ in. by $\frac{5}{16}$ in. (four pieces, one across each end both top and bottom).

This case is packed on the wide side of the case.

The specification of the case as regards timber, nailing, labelling, marking, and wiring is practically similar to that for apples.

Grading and Sizing the Fruit.—Standard grades of pears and sizes packed are subject to slight alteration each season. Those set for the 1937 export season are as follows:—

"Extra Fancy Grade": Pears of this grade shall be mature, sound, moderately clear skinned, well formed, carefully hand-picked from the tree, properly wrapped, true to name; free from disease, skin-puncture, skin broken at stem, and other defects which cause fruit to decay or which are likely to make the fruit unattractive to the consumer.

"Fancy Grade": Pears of this grade should be mature, sound, well formed, carefully hand-picked from the tree, properly wrapped, true to name; free from disease, skin-puncture, skin broken at stem, and other defects which cause fruit to decay or which are likely to make the fruit unattractive to the consumer.

Individual fruits of either grade should carry not more than the percentage of blemish or spray injury indicated in the following general list with respect to each variety in the respective grades.

The following varieties of pears are approved for export. The maximum size of pears offered for export shall be 3 in. and the minimum size $2\frac{1}{8}$ in.

Sizes to be as in attached list.

Variety.	Sizes.				Blemish.		Spray-injury.	
	Standard Pear-case.		Trays.					
	Max.	Min.	Max.	Min.	XF, %	F, %	XF, %	F, %
Bailey Berg	90	195	..	..	1	5	..	20
Beacon	90	195	..	..	1	5	..	20
Beurré Bosc	70	180	18	33	1	5	..	20
Beurré Capiaumont ..	90	195	..	..	1	5	..	20
Beurré Clairgeau ..	70	180	..	..	1	5	..	20
Beurré d'Amanlis	90	195	..	..	1	5	..	20
Beurré d'Anjou ..	90	195	18	33	1	5	..	20
Beurré Diel	90	165	..	..	1	5	..	20
Beurré Easter ..	90	165	..	..	1	5	..	20
Broompark	90	195	..	..	1	5	..	20
Chaumontel	90	195	..	..	1	5	..	20
Conference	80	180	..	..	1	5	..	20
Doyenné du Comice ..	80	195	18	33	1	5	..	20
Duchesse d'Angoulême	70	180	..	..	1	5	..	20
Elizabeth Cole ..	90	210	..	..	1	5	..	20
Giblin's Nelis ..	90	195	..	..	1	5	..	20
Glou Morçeau ..	90	165	..	..	1	5	..	20
Harrington's Victoria ..	70	180	..	..	1	5	..	20
Joséphine de Malines ..	90	210	..	..	1	5	..	20
Keiffer	70	180	..	..	1	5	..	20
L'Inconnue	90	210	..	..	1	5	..	20
Louise Bonne de Jersey	90	195	..	..	1	5	..	20
Madam Cole	90	210	..	..	1	5	..	20
Marie Louise ..	90	195	18	33	1	5	..	20
Packham's Triumph ..	80	180	..	..	1	5	..	20
P. Barry	70	180	..	..	1	5	..	20
Twyford Monarch ..	90	195	..	..	1	5	..	20
Vicar of Winkfield ..	70	180	..	..	1	5	..	20
Winter Cole	90	210	..	..	1	5	..	20
Winter Nelis	90	210	..	..	1	5	..	20

Only those varieties for which tray sizes are designated are acceptable packed in trays.

Pears in trays to be packed in wood-wool or in all-round corrugated straw-board wrap; strawboard to be of dimensions 30 in. by 17½ in. (approximately). Pears which are against the ends of the tray to be double-wrapped; the tray to be of a depth suitable to the size of pear, but any slack in the pack to be taken up with an extra pad of corrugated strawboard or wood-wool. Wrapping-paper of sizes 10 in. or 11 in. by 11 in. to be used for pears in trays, the size of wrap to be according to the size of pear. Where 11 in. by 11 in. is specified, 10 in. by 10 in. double wrapping may be substituted.

All pears in standard pear-cases to be packed with an all-round wrap of corrugated strawboard.

Packing the Box.

What has been written about the packing of apples is also applicable to pears; the principle of the system is the same although the actual packs themselves are different.

In pear-packing the same diagonal pocket is used. When placing the pears in the case after wrapping, all stalks should be pointing away from the packer towards the opposite end of the case, with the exception of the last pears placed in the layer, which should be reversed with calyx to the end of the case to obviate stalk damage. It is essential also that the two end rows of pears in each layer should be double-wrapped to obviate chafing on the end of the case.

Extra care in the handling of pears, especially when the fruit is being handled in the bins, is necessary. Owing to this class of fruit having longer stalks generally in comparison to apples, more damage is liable to accrue from stem punctures.

Below is given two pear-packing charts; one applies to round varieties of pears, such as Winter Cole, Winter Nelis, &c., and the other applies to elongated varieties, such as Beurré Bosc, P. Barry, and Vicar of Winkfield, &c.

Packing Chart for Standard Pear-case.

Round Varieties.

Style of Pack.	Number in Rows (Lengthwise).	Number of Tiers.	Count.	Approximate Sizes.
				In.
3–2	4–3	4	70	$3\frac{1}{4}$
3–2	4–4	4	80	$3\frac{1}{8}$
3–2	5–4	4	90	3
3–2	5–5	4	100	$2\frac{7}{8}$
3–2	6–5	4	110	$2\frac{3}{4}$*
3–2	6–6	4	120	$2\frac{3}{4}$
3–3	4–4	5	120	$2\frac{3}{4}$
3–2	7–6	4	130	$2\frac{5}{8}$
3–3	5–4	5	135	$2\frac{1}{2}$*
3–3	5–5	5	150	$2\frac{1}{2}$
3–3	6–5	5	165	$2\frac{3}{8}$
3–3	6–6	5	180	$2\frac{1}{4}$
3–3	7–6	5	195	$2\frac{1}{4}$
3–3	7–7	5	210	$2\frac{1}{8}$
4–3	6–6	5	210	$2\frac{1}{8}$

*Indicates increased variation upwards.

Elongated Varieties.

Style of Pack.	Number in Rows.	Number of Tiers.	Count.	Approximate Sizes.
				In.
3–2	4–3	4	70	3
3–2	4–4	4	80	$2\frac{7}{8}$
3–2	5–4	4	90	$2\frac{3}{4}$
3–3	4–3	5	105	$2\frac{5}{8}$*
3–2	6–5	4	110	$2\frac{5}{8}$
3–3	4–4	5	120	$2\frac{1}{2}$*
3–3	5–4	5	135	$2\frac{1}{2}$
3–3	5–5	5	150	$2\frac{3}{8}$
3–3	6–5	5	165	$2\frac{1}{4}$
3–3	6–6	5	180	$2\frac{1}{8}$

*Indicates increased variation upwards.

Storage and Shipping.

The fruits are seriously depreciated if large quantities are stacked close and left in an unventilated chamber for even a short period. This is particularly dangerous for early and mid-season fruit likely to ripen quickly and intended for shipment for a long distance. The packing-shed must be well ventilated and the stacks of fruit built so the air can circulate freely through them even when the packing-shed doors are closed. During the summer period especially the packed fruit should be despatched to the cool-store so soon as possible, as the heat and humidity at that season are liable to unduly hasten ripening.

Fungus diseases are responsible for serious losses in pears when they are cool stored for long periods. Grey mould *(Botrytis)* is often prevalent on the Winter Cole variety. This disease may be controlled to a considerable extent by the application of Bordeaux mixture a few days prior to picking the crop, by using only clean, dry cases for storing, and the wrapping of the fruit in copper-sulphate-treated wraps.

Losses of fruit from decay in storage and transit are to a great extent due to fungous spores getting access to the tissues of the fruit through injuries to the skin; commonly these are very slight and caused by bruising or nail marks which are hardly discernible and not noticed when they occur. The injury, however, is sufficiently large to provide ready entrance for the spores to grow and destroy the fruit. *This will be avoided by handling the fruit with care at all times, and packing and storing it under clean conditions.* The latter may be secured by sweeping up the packing-shed every afternoon when it is in use, promptly feeding waste fruit to stock; and spraying, washing, or fumigating the packing-shed and store with a reliable fungicide so soon as the season is finished. Attention should be given to the vicinity as well as the interior of the buildings.

WINTON EXPERIMENTAL AND DEMONSTRATION FARM.

SEASON 1936-37.

A. Stuart, Instructor in Agriculture, Invercargill.

The past season has been one of the wettest experienced for many years, there being very little summer weather experienced. These conditions resulted in a very good growth of grass, although it was somewhat soft and lacking in quality. On account of the wet spring, the preparation of land for cropping was very much delayed, and the seed-bed at sowing-time was not all that could have been desired. The continuation of the wet conditions, with the soil lying in a wet semi-waterlogged condition most of the season, was rather disastrous to root and fodder crops, which were very late and heavily infected with disease. Oat crops were quite good, but great difficulty was experienced in getting them harvested.

Butterfat showed an increase of 1,178 lb., and this increase was largely due to the pasture-growth, which ensured a plentiful supply of feed throughout the season. The herd was increased from thirty-three to thirty-five. Only six calves were reared, compared with ten the previous year. Eighty-one breeding-ewes were carried, and ninety-seven lambs were got away as fats.

Towards the end of the season the committee went into ways and means of improving the experimental status of the farm, and as a result of its deliberations decided to change over from dairying to sheep. It was felt that running the farm as a dairy-farm was not conducive to extensive experimental work, and, with the exception of one or two experiments of a minor nature, the farm was more of a commercial dairy-farm than an experimental farm. There are numerous successful commercial dairy-farms in Southland, so that there is no necessity to have a demonstration farm dealing with the straight-out commercial aspects of dairy farming, but that a growing need for a farm that can be almost entirely devoted to experimental work where trials in connection with pastures and crops can be undertaken. In connection with such trials it was felt that sheep offered a better medium of measuring experimental results than did dairy cows, as with this latter class of stock it is not advisable to subject them to experimental conditions when the farm authorities require to rely on them for the farm finance. Sheep on the other hand lend themselves more to the ups and downs of grazing that must be associated with certain trials, and do not react financially to the same extent as do dairy cows, or, in other words, they will stand more abuse than the dairy cow without causing such a heavy loss in revenue. The committee recognize that the revenue from sheep will probably not be as great as that from dairy cows, but realize the necessity for development in experimentation, and are prepared to make this sacrifice in the interests of progress. In changing over to sheep the committee are by no means introducing a type of farming new to the Winton district, for actually fat-lamb production is more extensive in this area than is the production of butterfat. The time is quite opportune, also, to do some intensive experimental work in connection with the fat-lamb business both from the point of view of breeds and in connection with animal health.

Root Crops.

Various trials were planned in connection with swedes and turnips, but owing to the late sowing, coupled with the wet cold season, this crop was practically a failure, and the experimental work was rendered null and void.

Oats.

A feature of interest was the growing of a block of Resistance oats. This variety is giving promise of excellent performance in Southland. The crop was spring-sown, and the block was situated in the centre of a field of Gartons Abundance. The Resistance was definitely better headed than the Gartons, although shorter in the straw, and approximately a week later maturing. There was ample evidence of its ability to stand up under adverse conditions, as it did not lodge, while the Gartons went down badly in parts. This characteristic is a valuable one for many Southland soil types.

Certified versus Uncertified Rye-grass.

This trial, which was put down in the spring of 1933, was planned to determine the relative carrying-capacity and productive capabilities of the certified rye-grass and the uncertified type (see *Journal of Agriculture*, February, 1937). During the past season the area sown with the certified rye-grass has again carried more stock and further increased the production of butterfat when compared with the area sown with uncertified rye-grass. Details are as follows :—

Month.	Certified Rye-grass.		Uncertified Rye-grass.	
	Cowdays per Acre.	Butterfat per Acre.	Cowdays per Acre.	Butterfat per Acre.
1936.				
September	21·6	22·2	15·2	15·9
October	38·8	42·39	22·8	24·36
November	38·4	42·86	26·0	30·77
December	54·4	57·46	41·2	43·17
1937				
January	56·0	55·05	28·0	26·29
February	56·0	45·55	28·0	22·89
March	27·8	19·45	14·0	9·79
April	42·0	29·49	18·6	10·04
May	6·5	3·76	Nil	Nil
June	4·0	2·14	Nil	Nil
July and August	Nil	Nil	Nil	Nil
Total for year	345·5	320·35	193·8	183·21
Total to date since first grazed ..	1,068·0	904·95	706·0	625·81

In addition 21·1 dry-stock days per acre have been obtained from the certified rye-grass, and 21·6 dry-stock days per acre from the uncertified rye-grass.

In June last an analysis of these two pastures was made and the result was as follows :—

——	Bare Ground.	Rye-grass.	White Clover.	Other Grasses.	Weeds.
Certified	23	49	23	29	0
Uncertified	22	19	38	27	12

At the time of writing the certified area presents a vigorous sward of rye-grass and white clover, although a few thistles and ragwort plants have made an appearance. White clover is dominant on the uncertified area, and the sward is rather open in places, giving entry to considerable quantities of thistles, ragwort, and brown-top in particular, together with other weed grasses.

Persistency of Certified Rye-grass.

The experiment where 200 plots of different rye-grass strains were sown was carried on another season, and further demonstrates the persistency of the certified strains of rye-grass. Practically all of the plots sown with uncertified rye-grass have deteriorated to such an extent that rye-grass is practically non-existent in them, and the sward is composed of a little clover, much inferior grass, and weeds, and is very open and low in production.

Reaction of Pastures to Grazing and Haying.

In the spring of 1934 two areas were sown down with similar plots to study the reaction of the various species to haying and grazing respectively. One of these areas has been hayed during the past two seasons with intermittent grazings, between the hayings, while the other area has been grazed intermittently right through and not closed for hay at all. These plots were recently point analysed with the following results :—

	Area hayed.	Area grazed.
Bare ground	20·0	13·0
Rye-grass	62·5	64·0
White clover	21·0	50·0
Red clover	16·5	6·5
Cocksfoot	16·5	3·5
Goose-grass	9·0	..
Poa annua	..	8·0
Sweet vernal	1·0	1·0
Thistles	0·5	..

The interesting points disclosed by this analysis are—(1) Haying has resulted in the sward opening up slightly ; (2) there has been no significant change in the rye-grass content ; (3) white clover has been severely checked by haying, while the red-clover content has increased ; (4) grazing has been detrimental to cocksfoot ; (5) goose-grass has thrived under haying, while *Poa annua* has appeared with grazing.

Rye-grass Germination Trouble.

In the spring of 1934, 314 strains of rye-grass were sown in individual plots to ascertain whether there did exist any strains of rye-grass that were immune to the fungus trouble that is associated with the seed harvested from the certified type of rye-grass in Southland in wet seasons. During the 1935–36 harvest the season was a good one for harvesting, the weather being dry, and as a result there was little trouble with the germination of any seed harvested. During the last season, however, wet conditions prevailed and much seed was ruined by the fungus. The plots were all harvested and the seed sent to the Department of Agriculture's Seed-testing Station, but unfortunately no results are yet to hand.

Timothy Strains.

Thirty-five strains of Timothy were sown in 1934, to study the growth and production of the different strains under Southland conditions. There are some outstanding differences between some of these strains, and the plots were harvested so that larger plots can be sown, when the better strains will be studied under pasture-grazing conditions.

Acknowledgment.

Mr. D. H. McLean (Chairman), Messrs. J. J. Blakie, H. Carswell, and J. G. Hazlett, relinquished their places on the farm committee early in the year, after long and arduous service, and the following members were elected : Messrs. J. H. Thomson (Chairman), J. Ewan, R. King, and Dr. P. Gow.

The committee again wishes to acknowledge the material assistance received from the R. M. McKinnon Trust, and the subsidy from the Department of Agriculture.

THE COMMERCIALIZATION OF HYBRID VIGOUR IN THE TOMATO.

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SUMMARY.

(1) SEVEN varieties of tomatoes reasonably distinct in type were intercrossed in season 1935–36, and the first-generation hybrids were grown in season 1936–37, with appropriate parent plants as controls.

(2) Out of twenty-nine cross-pollinations made, twenty-seven gave hybrids yielding more than either parent. The two remaining crosses gave hybrids intermediate in yield but closely approaching that of the higher-yielding parent.

(3) Seventeen of the hybrids were earlier than the parent varieties, eleven were intermediate in maturity, and one was later.

(4) Hybrids from crosses between varieties with dissimilar characteristics gave a greater expression of hybrid vigour than hybrids from crosses between less dissimilar varieties. The one late hybrid was from a cross between two very similar early types.

(5) The increases obtained would seem to warrant the use of first-generation hybrid seed by commercial growers, as the labour entailed in producing such seed is comparatively small.

(6) It is probable that trial crosses would have to be made by the growers in each district to produce the type of hybrid most suitable for that district.

The tomato is normally a self-fertilized plant. Cross-pollination between varieties, especially if they are of distinct types, produces a measure of heterosis or hybrid vigour in the first-generation hybrid. Owing to subsequent segregation, this initial vigour is diminished in the later generations of the cross. The possibility of commercializing hybrid vigour depends upon its extent, and on the cost of producing hybrid seed. As about 200 seeds are produced from one tomato, the method offers practical possibilities, provided that it is possible to obtain large increases in yield, and/or a hastening of maturity.

SEASONS 1933–35.

(For a fuller account see J. W. Hadfield and R. A. Calder(1).)

Experiments were commenced in New Zealand in 1933 to investigate the degree of hybrid vigour obtainable in the tomato, and the possibility of its commercialization. Four varieties of tomatoes were intercrossed, and the progeny grown in season 1934–35, at Palmerston North, with their respective parents as controls. Weighings of fruit were made throughout the season, allowing a determination both of periodic and of total yield.

The results indicated that, in certain crosses, the yield was increased beyond either parent, and also that in some cases there was a hastening of maturity. It was found that crosses between dissimilar varieties gave a greater expression of hybrid vigour than between those of similar type, thus confirming the results of L. Alabouvette and A. Titard(2). In the above experiment three of

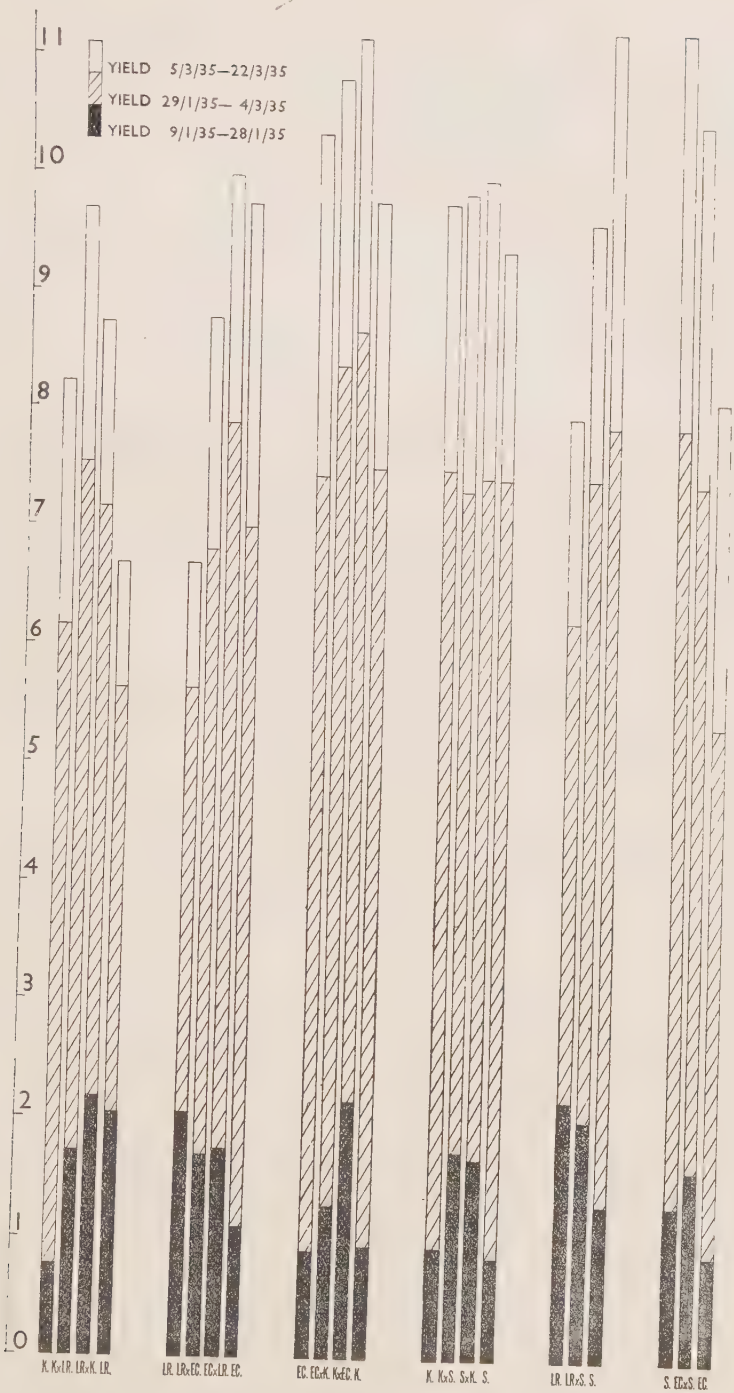

FIG. 1. GRAPH SHOWING COMPARATIVE YIELDS PER PLANT IN THREE HARVEST PERIODS FROM FOUR VARIETIES AND THEIR HYBRIDS DURING 1934–35.

E.C. = Early Cluster, K. = Kondine, L.R. = Large Red, S. = Sunrise.

the four varieties used were of similar type, and gave little increase in yield over the parents (Fig. 1). It was resolved to continue the experiment in an endeavour to discover more satisfactory combinations. For this purpose a larger number of varieties which showed greater variation in type were used.

Seasons 1935–37.

During season 1935–36 the following varieties of tomatoes were grown and cross-pollinated in as many combinations as possible: Abundance, Burwood, Earliana, Early Long Keeper, Kondine, Marglobe, and Market Favourite. Seed was obtained from the majority of crosses for trial in the 1936–37 season.

The young plants were planted out in November, 1936, staked, and pruned to a single stem in a manner similar to that adopted by the commercial grower. Each plot consisted of five plants, the hybrid plot being grown alongside the plots of the parent varieties, and at least four replications of each were planted where sufficient plants were available. Fruit was picked and weighed when it showed colour, up to three pickings per week being necessary in the middle of the season. There were twenty-four weighings altogether, and, by grouping these into periods, it is possible to obtain a measure of the relative earliness of the varieties and their hybrids.

General Observations.

The 1936–37 season was particularly unfavourable for tomato-growing in the Palmerston North district. The total rainfall and average temperatures were about normal, but the frequent occurrence of cold, wet, windy periods markedly reduced the number of sunshine hours. As a result, the crop made slow growth, the yields were poor, and the fruit ripened with difficulty.

In general the hybrid plants were more robust than the parents. Where the height of the two parents was similar, the hybrid was taller than either. Where one parent was much taller than the other, the hybrid was as tall, or very nearly as tall, as the tall parent.

Most of the hybrid plants gave a higher yield than the parent varieties. A majority gave also an increase in earliness measured as fruit picked in the first month of harvest. In only one case, in which two varieties crossed were similar in type, was the hybrid of later maturity than both parents.

In most cases the fruit was as high in quality as that of the parents, but the season was such that the fruit of even the standard varieties used was somewhat inferior in this respect. There was a tendency for the fruit to exhibit a strong resemblance to the maternal parent.

Summarized, the position was as follows:—

Number of crosses made = 29.

Number giving an increase in yield over both parents = 27.

Average increase in yield of these twenty-seven hybrids over the parents = 104·6 per cent.

Average increase in yield of all hybrids over the parents = 95 per cent.

Number giving yield intermediate between parents = 2.
Number giving lower yield than both parents = 0.
Number of crosses earlier than both parents = 17.
Average increase in yield of these seventeen hybrids over both parents in the first month of harvest = 144 per cent.
Number intermediate in maturity between parents = 11.
Number later than both parents = 1.

As yield and maturity are the two most important factors, these will be considered in relation to each cross. The twenty-four weighings are presented in three harvest periods and as a total. The season was very late, and hence the first period of harvest extended up to 13th March, 1937. During this period tomatoes were relatively scarce and retailed in the local market at about 8d. per pound. The second period, which was from 14th March to 13th April gave the heaviest yield. The market price during this period was from 4d. to 6d. per pound. The final period was from 14th to 30th April, when all fruit was picked owing to the onset of frosts. The retail price had dropped to 2d. to 3d. per pound.

The significance of early maturity is very obvious, since the monetary value of any increased yield obtained during the first period is so much greater than that of a corresponding increase later in the season.

Yields were much below those normally experienced in the district. However, the results would indicate that the hybrid plants were not so much affected by the adverse conditions as were the parent varieties.

The yields given are in each case the average of the several replications, each of five plants. In all cases the maternal parent of a cross is mentioned first. Notes are added on each cross, including a short description of fruit quality. The yields are summarized in Figs. 2 and 3.

Table 1.—Marglobe × Kondine.

	Yield of Fruit in Pounds (Five Plants).			
	1.	2.	3.	Total.
Marglobe	1·11	3·74	1·16	6·01
Marglobe × Kondine	1·50	6·66	3·56	11·72
Kondine × Marglobe	1·71	4·77	1·66	8·14
Kondine	1·47	5·18	1·86	8·51

Kondine was the heavier-yielding and earlier parent. Marglobe × Kondine was as early as Kondine and yielded more heavily. Kondine × Marglobe was very similar to Kondine in total yield and maturity.

The fruit-quality was generally good and up to the standard of Kondine. Marglobe tended to crack badly round the top of the fruit, and a few of the Marglobe × Kondine hybrids exhibited this fault.

Table 2.—Kondine × Market Favourite.

	Yield of Fruit in Pounds (Five Plants).			
	1.	2.	3.	Total.
Kondine	1·47	5·18	1·86	8·51
Kondine × Market Favourite ..	2·69	5·90	4·47	13·06
Market Favourite × Kondine ..	2·44	7·03	4·72	14·19
Market Favourite	3·61	3·40	1·66	8·67

Both parents had a similar total yield, but Market Favourite was decidedly the earlier. The hybrids were intermediate in maturity, their higher yields in the second and third periods giving them a total

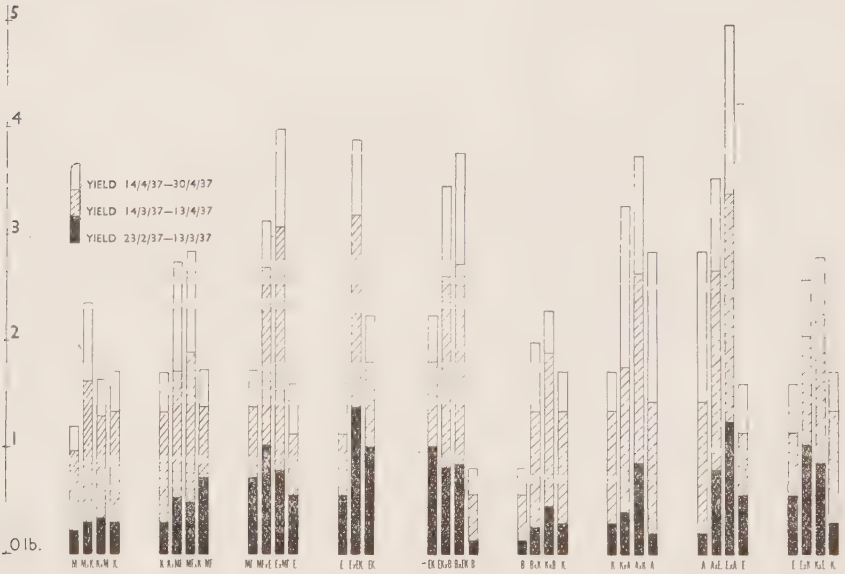

FIG. 2. GRAPH SHOWING COMPARATIVE YIELDS PER PLANT IN THREE HARVEST PERIODS FROM VARIETIES AND HYBRIDS DURING 1936–37.

A. = Abundance, B. = Burwood, E. = Earliana, E.L.K. = Early Long Keeper, K. = Kondine, M. = Marglobe, M.F. = Market Favourite.

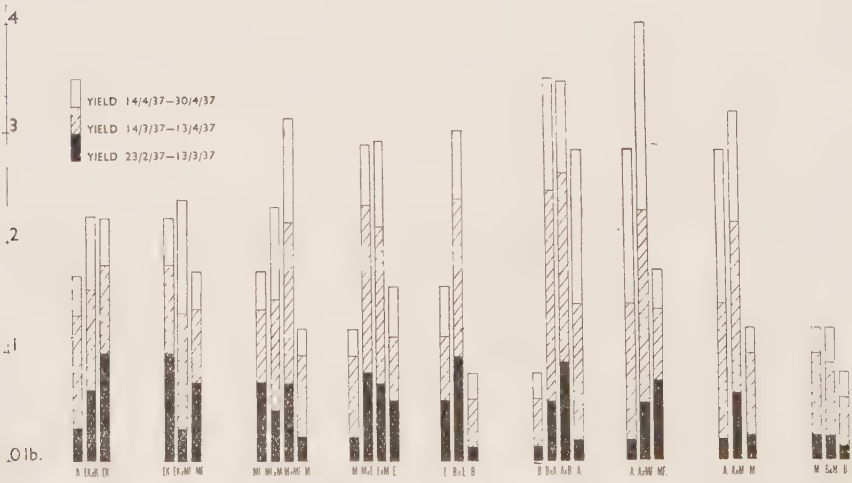

FIG. 3. CONTINUATION OF FIG. 2.

yield greater than either parent. The fruit-quality of Kondine × Market Favourite was good, but that from the reciprocal was not so satisfactory. Both gave fruit medium in size.

Table 3.—Market Favourite × Earliana.

	Yield of Fruit in Pounds (Five Plants).			
	1.	2.	3.	Total.
Market Favourite	3·61	3·40	1·66	8·67
Market Favourite × Earliana ..	5·12	8·31	2·19	15·62
Earliana × Market Favourite ..	3·94	11·34	4·62	19·90
Earliana	2·75	2·90	2·28	7·93

The two parents gave somewhat similar yields, but, while both were early types, Market Favourite was the earlier one. Each of the hybrids was earlier than either parent, with total yields 80 per cent. and 130 per cent. respectively above Market Favourite. Fruit-size was medium to large, and of good quality.

Table 4.—Earliana × Early Long Keeper.

	Yield of Fruit in Pounds (Five Plants).			
	1.	2.	3.	Total.
Earliana	2·75	2·90	2·28	7·93
Earliana × Early Long Keeper ..	6·87	9·04	3·38	19·29
Early Long Keeper	4·95	4·01	2·09	11·05

Early Long Keeper was a heavy-yielding, very early variety. Yet the hybrid was much earlier than either parent, and yielded roughly 75 per cent. more fruit of fairly good quality and of a size similar to the parents. The reciprocal was not available.

Table 5.—Early Long Keeper × Burwood.

	Yield of Fruit in Pounds (Five Plants).			
	1.	2.	3.	Total.
Early Long Keeper	4·95	4·01	2·09	11·05
Early Long Keeper × Burwood ..	4·0	9·00	4·19	17·19
Burwood × Early Long Keeper ..	4·22	9·37	5·16	18·75
Burwood	0·66	2·16	1·14	3·96

Burwood produced low yields in all periods. Yet its hybrids produced almost as much fruit as Early Long Keeper in the early period, and at least twice as much in periods 2 and 3. As a result, total yields were 55 per cent. and 70 per cent. respectively above Early Long Keeper. However, the fruit was of rather poor quality, many being hollow. Fruit-size was medium to large.

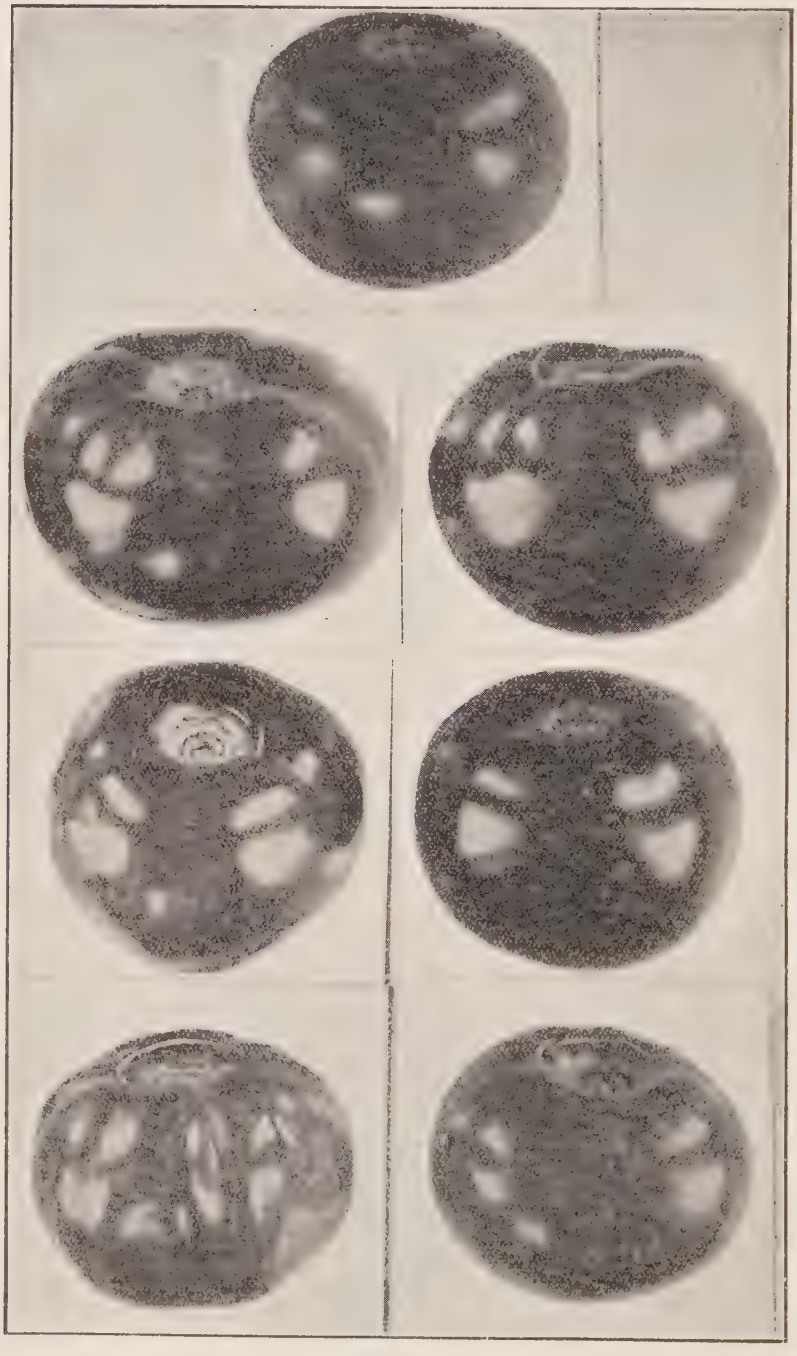

FIG. 4.

Top: Kondine. Left: Kondine × Market Favourite (upper), Market Favourite × Kondine, Market Favourite. Right: Kondine × Earliana (upper), Earliana × Kondine, Earliana.

Table 6.—Burwood × Kondine.

	Yield of Fruit in Pounds (Five Plants).			
	1.	2.	3.	Total.
Burwood	0·66	2·16	1·14	3·96
Burwood × Kondine	1·25	5·44	3·22	9·91
Kondine × Burwood	2·22	7·19	1·90	11·31
Kondine	1·47	5·18	1·86	8·51

Both hybrids produced a higher total yield than Kondine, but only one, Kondine × Burwood, was earlier than both parents. The fruit-quality was fair to good, and the size medium.

Table 7.—Kondine × Abundance.

	Yield of Fruit in Pounds (Five Plants).			
	1.	2.	3.	Total.
Kondine	1·47	5·18	1·86	8·51
Kondine × Abundance	1·96	6·77	7·53	16·26
Abundance × Kondine	4·28	8·81	5·45	18·54
Abundance	0·97	6·14	6·97	14·08

Abundance was a heavy-yielding, late-maturing variety, producing an abundance of small but well-shaped fruits. The hybrids were earlier than either parent, and produced a greater total yield. The fruit was of good quality, but there was a tendency for the small-fruit size of Abundance to be inherited.

Table 8.—Abundance × Earliana.

	Yield of Fruit in Pounds (Five Plants).			
	1.	2.	3.	Total.
Abundance	0·97	6·14	6·97	14·08
Abundance × Earliana	3·94	9·34	4·25	17·53
Earliana × Abundance	6·19	10·66	7·81	24·66
Earliana	2·75	2·90	2·28	7·93

In this case both the hybrids were much earlier than either parent, and produced a much greater total yield. The cross Earliana × Abundance produced the highest-yielding plots in the trial. The fruit was of good quality, though rather small in size. Earliana × Abundance showed some cracking around the top of the fruit.

Table 9.—Earliana × Kondine.

	Yield of Fruit in Pounds (Five Plants).			
	1.	2.	3.	Total.
Earliana	2·75	2·90	2·28	7·93
Earliana × Kondine	5·09	5·09	2·63	12·81
Kondine × Earliana	4·22	6·97	2·63	13·82
Kondine	1·47	5·18	1·86	8·51

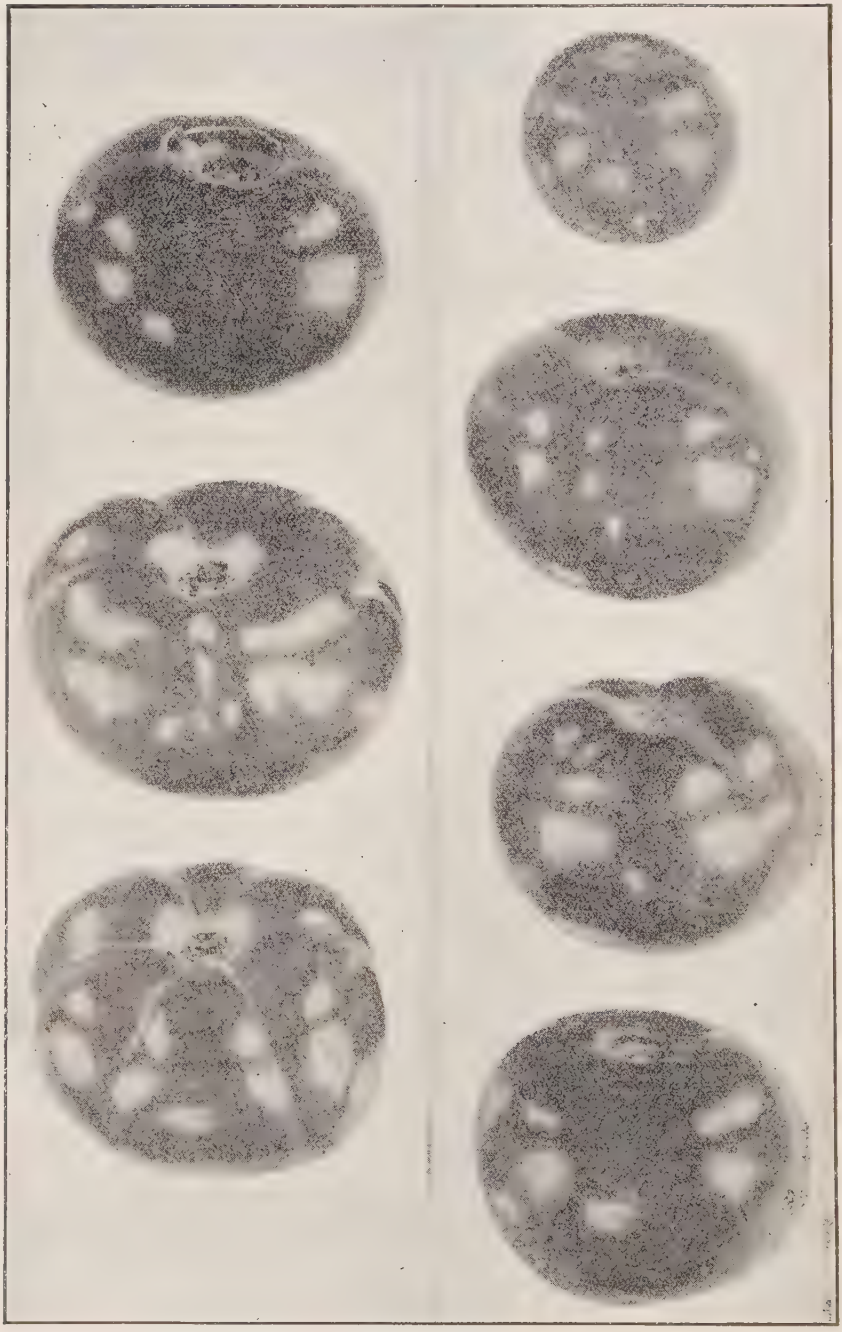

FIG. 5.

Left: Earliana (top), Earliana × Early Long Keeper, Early Long Keeper. Right: Abundance (top), Abundance × Kondine, Kondine × Abundance, Kondine.

In both hybrids earliness and total yield were improved when compared with the parents. The fruit was of good quality, and in appearance exhibited a close resemblance to the maternal parent. Fruit-size, medium to large.

Table 10.—Kondine × Early Long Keeper.

	Yield of Fruit in Pounds (Five Plants).			
	1.	2.	3.	Total.
Kondine	1·47	5·18	1·86	8·51
Early Long Keeper × Kondine ..	3·25	4·62	3·34	11·21
Early Long Keeper	4·95	4·01	2·09	11·05

The maturity of the hybrid was intermediate between the parents and the total yield similar to Early Long Keeper. However, the hybrid was significantly better than Kondine in these respects. The fruit was of good quality, though medium to small in size. The reciprocal was not available.

Table 11.—Early Long Keeper × Market Favourite.

	Yield of Fruit in Pounds (Five Plants).			
	1.	2.	3.	Total.
Early Long Keeper	4·95	4·01	2·09	11·05
Early Long Keeper × Market Favourite	1·47	5·25	5·25	11·97
Market Favourite	3·61	3·40	1·66	8·67

Early Long Keeper and Market Favourite were rather similar in type, though the former was somewhat the better of the two. The hybrid gave a slight increase in total yield, but was the only case where maturity of a hybrid was later than either parent. This was probably due to the similarity in parental type. The fruit was of fair quality, and medium in size.

Table 12.—Market Favourite × Marglobe.

	Yield of Fruit in Pounds (Five Plants).			
	1.	2.	3.	Total.
Market Favourite	3·61	3·40	1·66	8·67
Market Favourite × Marglobe ..	2·31	5·06	4·22	11·59
Marglobe × Market Favourite ..	3·50	7·37	4·78	15·65
Marglobe	1·11	3·74	1·16	6·01

Here maturity was equal to the earlier parent in one cross, but intermediate in the reciprocal. Both the hybrids gave higher yields than the parents, one being much higher than Market Favourite. The fruit-quality was good, but medium in size.

Table 13.—Marglobe × Earliana.

	Yield of Fruit in Pounds (Five Plants).			
	1.	2.	3.	Total.
Marglobe	1·11	3·74	1·16	6·01
Marglobe × Earliana	4·0	7·65	2·75	14·40
Earliana × Marglobe	3·53	7·15	3·88	14·56
Earliana	2·75	2·90	2·28	7·93

Both the hybrids produced greater crops in all three periods, giving a greater increase in total yield. Fruit-quality was generally good, though some tended to split around the top. The fruit was fairly large in size.

Table 14.—Burwood × Earliana.

	Yield of Fruit in Pounds (Five Plants).			
	1.	2.	3.	Total.
Burwood	0·66	2·16	1·14	3·96
Burwood × Earliana	4·72	7·15	3·16	15·03
Earliana	2·75	2·90	2·28	7·93

The hybrid available was much earlier than either parent, with a total yield 89 per cent. above Earliana. The fruit-quality was good, though of medium size.

Table 15.—Burwood × Abundance.

	Yield of Fruit in Pounds (Five Plants).			
	1.	2.	3.	Total.
Burwood	0·66	2·16	1·14	3·96
Burwood × Abundance	2·65	9·63	5·12	17·40
Abundance × Burwood ..	4·44	8·63	4·16	17·23
Abundance	0·97	6·14	6·97	14·08

In this case there was a marked hastening of maturity on crossing, as well as some increase in yield. However, the fruit was too small for commercial requirements, due to the influence of the Abundance parent.

Table 16.—Abundance × Market Favourite.

	Yield of Fruit in Pounds (Five Plants).			
	1.	2.	3.	Total.
Abundance	0·97	6·14	6·97	14·08
Abundance × Market Favourite ..	2·61	8·72	8·60	19·93
Market Favourite	3·61	3·40	1·66	8·67

The hybrid was intermediate in maturity, though tending towards the earlier parent. The total yield was much greater than either parent. The fruit was good, but small.

Table 17.—Abundance × Marglobe.

	Yield of Fruit in Pounds (Five Plants).			
	1.	2.	3.	Total.
Abundance	0·97	6·14	6·97	14·08
Abundance × Marglobe.. ..	3·03	7·72	5·03	15·78
Marglobe	1·11	3·74	1·16	6·01

The hybrid was earlier than either parent, and slightly more productive. The fruit was of good quality, though rather small in size.

Table 18.—Marglobe × Burwood.

	Yield of Fruit in Pounds (Five Plants).			
	1.	2.	3.	Total.
Marglobe	1·11	3·74	1·16	6·01
Burwood × Marglobe	1·03	3·34	1·63	6·00
Burwood	0·66	2·16	1·14	3·96

The hybrid showed no superiority to Marglobe. The fruit was of good quality and medium in size.

Discussion.

It will be seen from a perusal of the results that practically all the hybrids have given total yields higher than both parents; the superiority was such that the average increase of all the hybrids over the parent varieties was 95 per cent. A majority also gave a decided increase in the yield of fruit picked in the early period.

It would be necessary to use first-generation hybrid seed each year, as the measure of increase obtained in the first-generation hybrids is not expressed to the same extent in later generations. However, tomato-seed retains its viability for a considerable time, so that enough seed could be produced in one season to last for several years. Very little labour is involved in the production of hybrid seed. A few plants of the desired parental types must be grown and cross-fertilized at the appropriate period. A description of the method of hybridization can be found in reference (1). With a little experience, over one hundred flowers can be crossed in one day. Allowing from one to two hundred seeds per fruit, enough seed would be produced to plant 1 to 2 acres.

Each district requires a certain type of tomato for its specific market requirements. It is, therefore, most likely that growers in each district would have to experiment, to some extent at least, with the object of discovering which two varieties, when

crossed one with another, would give, not only a measure of earliness and increased yield in the first-generation hybrid, but also the type of tomato which they require.

ACKNOWLEDGMENTS.

The foregoing experiment and the preparation of this article were accomplished under the direction of Messrs. J. W. Hadfield and R. A. Calder.

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MANGELS.

SOME CHARACTERISTICS OF VARIETIES GROWN IN NEW ZEALAND.

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IN New Zealand an area of approximately 13,000 acres is occupied annually by mangels. The provincial acreages for the 1935–36 season were:—

North Auckland	210	Marlborough	121
Auckland	524	Westland	4
Gisborne	196	Canterbury	4,304
Hawke's Bay	708	Otago	2,390
Taranaki	807	Southland	127
Wellington	3,732		
Nelson	87	Total	13,210

Although the total acreage is not large, the crop is well distributed; it is grown most extensively in Canterbury, Wellington, and Otago. In consideration of the fact that mangels are an excellent winter forage crop it would seem that a further increase is warranted.

Mangels prefer warm conditions and, for highest yields, a fertile soil. When well established they can withstand drought better than other root crops and suffer little handicap on account of disease. Yields of from 50 tons to 60 tons per acre are common over wide areas and the roots afford a palatable, wholesome, succulent forage for winter use.

Practically all the seed used is imported from England. There are numerous varieties which vary in behaviour as well as in appearance—*e.g.*, the long or semi-long types thrive best on soils which are rich and fertile, whereas for poorer conditions it is preferable to grow the intermediates, tankards, or globes.

In order to obtain some information concerning the characteristics of the different types, an investigation was commenced in the 1934–35 season. Distinct lines of different varieties were obtained from seed-merchants and grown at Palmerston North.

In comparing the different lines and in contrasting the different varieties, type observations were recorded, approximate yields were obtained, and sugar and dry-matter contents were determined.

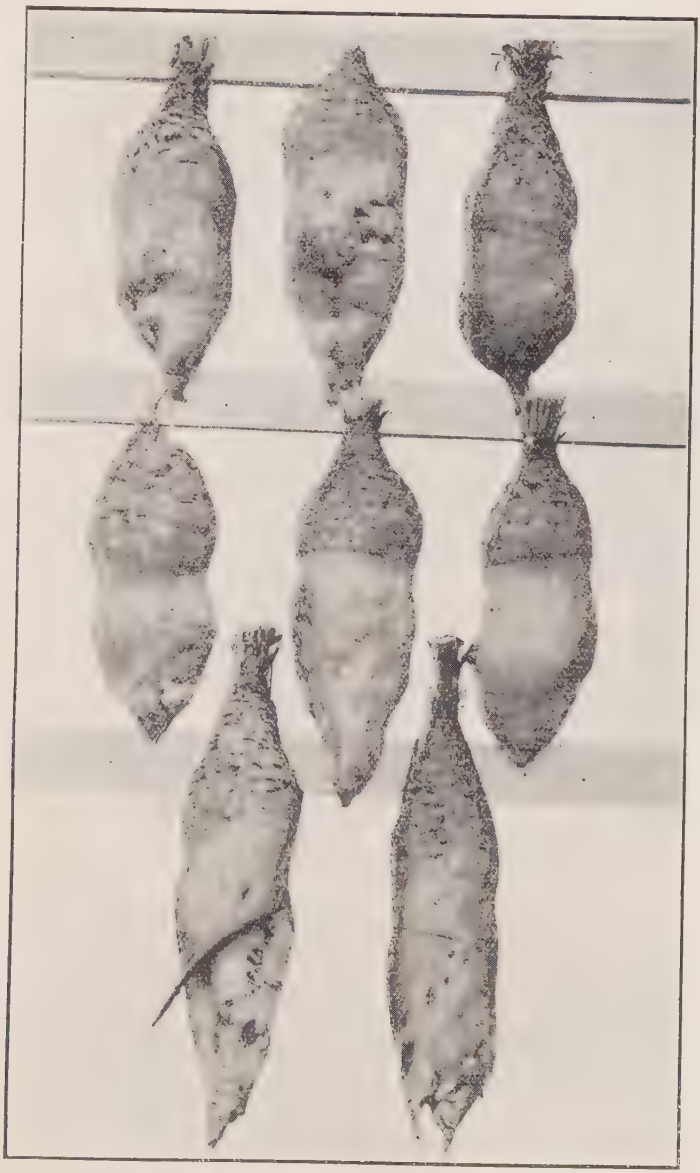


FIG. 1. TOP, GOLDEN TANKARD; MIDDLE, RED INTERMEDIATE; BOTTOM, LONG RED.

NOTE.—Root-size cannot be compared in the separate photographs.

TYPES OF MANGELS.

Mangel varieties may be grouped according to their shape, and the most convenient expression of this character is a length to breadth ratio. Table I shows a classification based on such determinations, and includes observations on skin and flesh colour.

Table I.—Classification of Varieties according to Shape, with a Description of Skin and Flesh-colour.

Class and Variety.	Skin-colour.	Flesh-colour.
Long (length/breadth, ratio 4 : 1)—		
Long Red (Fig. 1) ..	Bright red below; duller red above	White, with uneven red bands or rings.
Semi-long (length/breadth, ratio 3·5 : 1)—		
Sugar 1 (Fig. 2) ..	Pale red or pink below; dull pinkish-green above	Dominant white with darker bands; a few with pink bands.
Sugar 2	White below; drab green above	White.
Jersey Queen (Fig. 2) ..	Yellow or pale orange below; bronze-green above	White, with darker bands.
Gatepost (Fig. 2) ..	Pale yellow below; bronze-green above	White with, occasionally, greenish-yellow bands.
Dairyman (Fig. 2) ..	Pale yellow to light orange below; pale bronze-green above	White, with darker bands, which are occasionally a very pale green.
Intermediate (length/breadth, ratio 2·5 : 1)—		
Red Intermediate (Fig. 1)	Bright red below; dull reddish-green above	White, with occasional uneven red bands.
Tankard (length/breadth, ratio 2·5 : 1)—		
Golden Tankard (Fig. 1)	Bright orange below; drab, pale greenish-brown above	Whitish cream to yellow, with dark-yellow bands.
Semi-globe (length/breadth, ratio 2 : 1)—		
White Knight (Fig. 5)..	Greenish or pale yellow below; drab, bronze-green above	White.
Globe (length/breadth, ratio 1·5 : 1)—		
Prizewinner (Fig. 3) ..	Yellow or yellow-brown below; bronze-green above	White, with faintly darker bands.
Yellow Globe (Fig. 3) ..	Yellow or yellow-brown below; bronze-green above	White, with, occasionally, uneven yellow bands.
Orange Globe 1 (Fig. 4)	Dark orange below; drab, light-brown above	Pale yellow, with dark-yellow or yellow-brown bands.
Orange Globe 2 (Fig. 4)	Medium to dark orange below; drab, green-brown above	White, with darker bands occasionally tinged yellow.
Orange Globe 3 (Fig. 4)	Pale orange to yellow below; drab, bronze-green above	Mainly white, with darker bands; a few with yellowish bands.
Golden Standwell (Fig. 5)	Bright orange below; drab, pale greenish-brown above	Whitish cream to yellow, with dark-yellow bands.
Lemon Globe (Fig. 3) ..	Cream or pale yellow below; bronze-green above	White, with darker bands.
Quite Content (Fig. 5)	Pale pink to light red below; greenish-pink above	White, with darker bands.

Two distinct types were received under the varietal name of "Sugar" mangel, and three under the name of "Orange Globe." The differences in each case, however, were not outside the limits of variation that might be expected to arise as a result of several firms selecting the same variety along individual lines. "Dairyman" and "Jersey Queen" proved to be very much alike, while "Prizewinner" and "Yellow Globe" appeared identical.

A characteristic of "Red Intermediate" and to a lesser extent of "Golden Tankard" was the incurving of the root at the middle resulting in a definite waist.

FIG. 2. TOP LEFT, RED SUGAR; TOP RIGHT, JERSEY QUEEN; BOTTOM LEFT, DAIRYMAN; BOTTOM RIGHT, GATEPOST.

Varietal Purity.

For most varieties there are a number of strains available. These, generally, are indistinguishable, though occasionally some are less satisfactory than others; they may be of a poorer type or contain a higher percentage of rogues. Occasionally also they become incorrectly named. One of the purposes of the trial was to investigate this position.

The general standard of purity proved to be reasonably satisfactory. Four lines out of 45, or about 9 per cent., were incorrectly named, but the percentage of foreign varieties and off types within each line amounted to only about 1 per cent. Therefore, while the nomenclature of varieties may be a little at fault, the standard of purity is high. Observations were made on the incidence of disease; very little was in evidence.

Records taken may be observed in Table II.

Table II indicates the number of lines of the different varieties which were received, the number incorrectly named, the degree of type purity, and the incidence of disease.

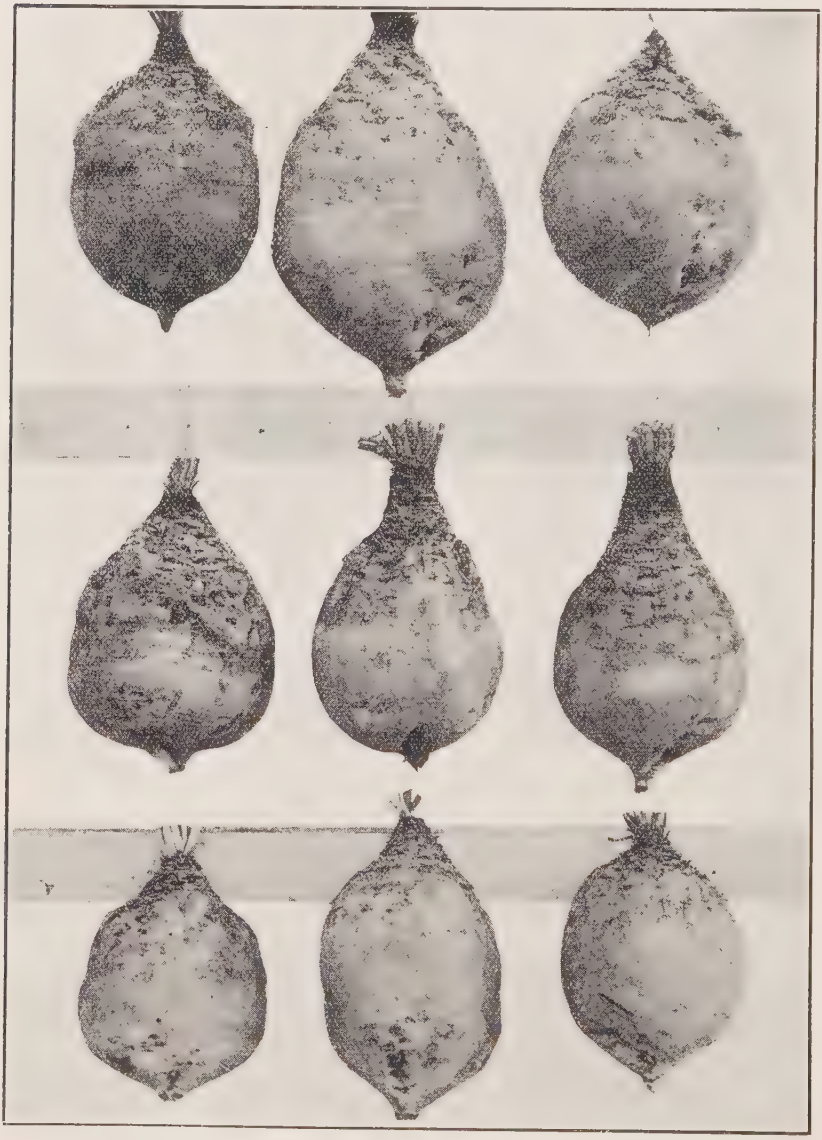


FIG. 3. TOP, YELLOW GLOBE; MIDDLE, PRIZEWINNER; BOTTOM, LEMON GLOBE.

Table II.

Variety.	Number of Lines sent in.	Number of Lines incorrectly named.	Average Per Cent. of Rogues and off Types.	Average Per Cent. of Diseased Roots.	Remarks.
Long Red ..	5	..	0·4	0·8	
Sugar (red) ..	3	..	0·7	1·4	Red Sugar mangel.
Sugar (white) ..	1	..	0·5	..	White Sugar mangel.
Jersey Queen ..	5	2	1·4	..	One line judged to be Golden Tankard; one line judged to be Yellow Globe.
Gatepost ..	2	1	5·5	..	One line judged to be Long Red.
Dairyman ..	1	..	..	..	Rather similar to Jersey Queen.
Red Intermediate	5	..	0·4	..	One line named Red Lion.
Golden Tankard	4	..	..	1·1	
White Knight ..	2	1	2·8	..	One line judged to be Golden Tankard.
Prizewinner ..	5	..	0·4	0·4	Similar to Yellow Globe.
Yellow Globe ..	5	..	..	0·4	
Orange Globe 1 ..	1	..	..	..	Probably Golden Globe.
Orange Globe 2 ..	1	..	..	..	
Orange Globe 3 ..	2	..	1·1	..	
Golden Standwell	1	..	..	..	
Lemon Globe ..	1	..	2·3	..	
Quite Content ..	1	..	..	..	
Total ..	45	4	..	..	

Yield and Chemical Analyses.

The feeding-value of mangels depends upon their dry-matter content, of which sugar is the most important constituent. Varietal differences exist in regard both to yield and to composition, but as these qualities are influenced by environmental factors it is difficult to obtain representative averages.

An attempt was made, nevertheless, to determine the comparative values of a few varieties, based on yielding-ability and on dry-matter and sugar content. The results are offered in Table III, but as they have been obtained from an insufficient number of trials no strict reliance can be placed upon them.

Table III.—Yields and Analyses of Mangel Varieties.

Variety.	A. Yields, in Tons per Acre, 1934–35.	B. Yields in Tons per Acre, 1935–36.	Average of A and B.	Dry-matter Per Cent., 1935–36.	Dry-matter Yield, Tons Per Acre, 1935–36.	Sugar, Per Cent., 1935–36.	Sugar Yield, Tons Per Acre, 1935–36.	Average Weight of a Single Root, in Grams, 1935–36
Long Red	64·1	47·0	55·6	9·7	4·56	6·3	2·96	2,214
Sugar 1 (red) ..	68·1	37·5	52·8	13·2	4·95	8·0	3·00	1,941
Sugar 2 (green) ..	74·5	50·0	62·3	9·5	4·75	5·4	2·70	2,434
Jersey Queen ..	72·2	51·0	61·6	8·9	4·54	5·1	2·60	2,431
Red Intermediate ..	74·0	58·0	66·0	8·2	4·76	5·0	2·90	2,839
Golden Tankard ..	65·0	36·0	50·5	9·8	3·53	5·6	2·01	2,084
White Knight ..	75·7	55·5	65·6	8·4	4·66	4·9	2·72	3,324
Yellow Globe ..	68·8	60·0	64·4	8·1	4·86	5·3	3·18	2,741
Orange Globe (3) ..	73·3	72·0	72·6	7·2	5·18	4·1	2·95	2,931
Lemon Globe ..	84·7	66·5	75·6	7·7	5·12	4·2	2·79	3,437

Comments on Table III.

1. Yields in the 1934 35 season were obtained from plots grown at the Plant Research Area, Palmerston North. In the 1935–36

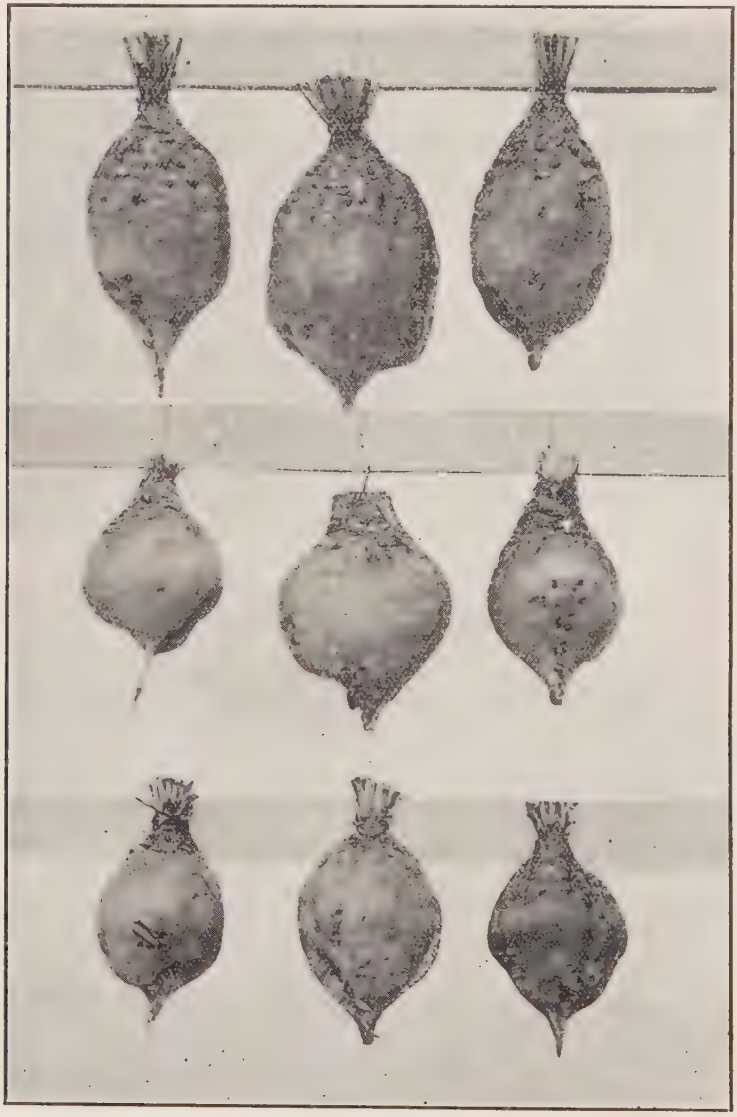


FIG. 4. TOP, ORANGE GLOBE 1; MIDDLE, ORANGE GLOBE 2; BOTTOM, ORANGE GLOBE 3.

season the trial was repeated at Massey College, and representative samples were forwarded to the Dominion Analyst, Wellington, for analysis.

2. With some exceptions, the following relationships between certain characteristics are indicated :—

(*a*) *Shape and Yield.*—The longer-shaped varieties tend to produce lower yields than the globe-shaped types.

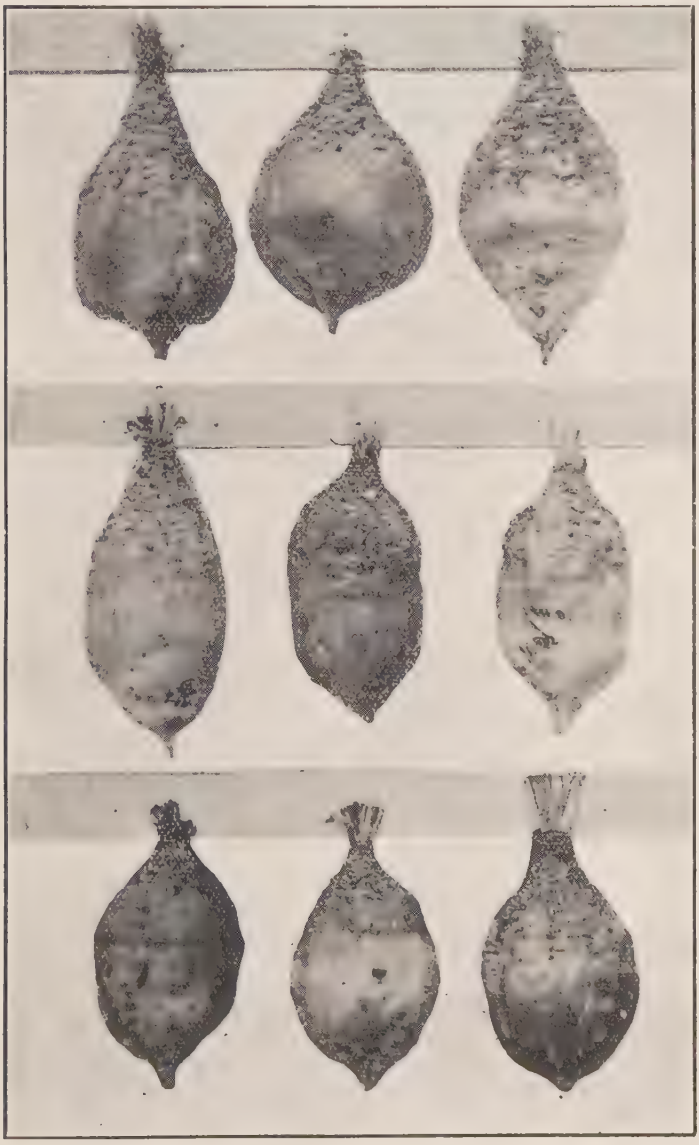


FIG. 5. TOP, QUITE CONTENT; MIDDLE, WHITE KNIGHT; BOTTOM, GOLDEN STANDWELL.

(*b*) *Yield and Quality.*—Types giving the heaviest yields are poorer in dry-matter and sugar content than those giving lower yields.

(*c*) *Size and Yield.*—The heaviest yields were obtained from those varieties with the largest individual roots.

(*d*) *Size and Quality.*—The larger roots tend to be poorer in dry-matter and sugar content than the smaller ones. The extra quality possessed by the Red Sugar mangel has in all probability been inherited from its sugar-beet parent.

3. If the yield per acre of dry matter or sugar can be regarded as a measure of the value of a variety then, with the exception of Golden Tankard, there is little to choose between any of those tested; in all probability none of the differences would be significant.

From these results it might be concluded that, from a theoretical point of view, there is little difference in the ultimate feeding-value of any of the varieties considered, Golden Tankard excepted. When viewed practically, though, distinctions can be made for, within certain limits, a variety providing a heavy crop of poor quality would not be such an efficient feeding unit as one giving a lower yield but of better quality.

In connection with these results, the observations of Professor Boving, University of British Colombia, Vancouver, Canada, are of interest. He states: "In no case during thirty years of comparative tests has the Long Red mangel been able to compare in total yield or in feeding value with good varieties of the intermediate or ovoid types. The probable reason why, nevertheless, it has survived in practice is that it was the first mangel to be listed in a seedsman's catalogue." He mentions that the Globes are poorer in dry matter than the intermediates, and continues, "but they (the Globes) may be recommended, nevertheless, where mangels are grown entirely as a conditioner and where the feeding value is of less importance than succulence. Cylindrical mangels are reasonably good total yielders, but they are low in production of dry matter per acre. The Red Sugar mangel cannot compete with the intermediate or ovoid in yield, but, as it is a very good keeper, and, as the composition of its dry matter has a particularly good effect in pig and poultry feeding, it is well worth growing on a limited scale."

These conclusions are not so widely different from those offered above, with the exception that, from the Palmerston North results, the Long Red mangel could not be so severely condemned.

Loss in Weight during Pitting.

Mangels are generally pitted for some months before feeding. During this period changes take place in the chemical composition of the roots and there is a decrease in weight due, mainly, to the loss of moisture.

Twenty representative roots of the more commonly grown varieties were weighed on pulling and pitted under straw; care was taken to subject each variety to the same conditions. At the end of three months they were again weighed.

The loss of weight during the period of storage is recorded in Table IV. It will be seen that the average loss is about 14 per cent., with a range from 11 per cent. to 17·4 per cent. according to variety.

Loss of weight during pitting must, however, vary considerably according to the method adopted, and the relative loss of an individual root will depend upon the position it occupies in the pit.

Such a trial as this would have to be repeated for several seasons and under varying conditions of pitting before a reliable average could be indicated.

Table IV shows loss of weight, during storage, for some of the more important commercial varieties.

Table IV.

Variety.	Weight, in Pounds, of Twenty Roots prior to Pitting, 23rd June, 1936.	Weight, in Pounds, of same Twenty Roots after Pitting, 2nd September, 1936.	Actual Loss, in Pounds.	Percentage Loss.
Long Red	126·0	107·0	19·0	15·1
Sugar 1	111·4	92·0	19·4	17·4
Sugar 2	125·2	109·5	15·7	12·5
Jersey Queen	128·3	112·4	15·9	12·4
Red Intermediate ..	137·4	120·0	17·4	12·7
Golden Tankard ..	111·2	93·5	17·7	15·9
White Knight	168·2	146·2	22·0	13·1
Yellow Globe	151·0	128·8	22·2	14·7
Orange Globe	169·5	150·8	18·7	11·0
Lemon Globe	153·5	133·2	20·3	13·2

Summary.

1. The mangel varieties commonly grown in New Zealand have been grouped according to shape; skin and flesh colour has been described.

2. A number of lines of each of the varieties were received. These were examined to determine the percentage incorrectly named, the degree of type purity and the incidence of disease.

3. An attempt was made to evaluate the varieties based on total yield and on dry-matter and sugar content.

4. Approximate figures for the loss of weight during storage were obtained.

Acknowledgments.

This work was supervised by Mr. J. W. Hadfield, Director, Agronomy Division. The yield trials at Massey College were carried out under the direction of the ex Dairy-farm Manager, Mr. S. McGuiness, the analyses were determined by the Dominion Analyst, Wellington, and the photographs were taken by Mr. H. Drake.

SEASONAL NOTES.

THE FARM.

Special Measures regarding Winter Feed.

An outstanding feature of the present farming position throughout most of New Zealand is the prospective abnormally large shortage in reserves of feed for use in the winter and early spring of next year. The normal provision of feed for this critical period is substantially less than sufficient to meet the economic needs of stock—a fact which often is well demonstrated when comparisons are made between the returns of farms of an average standard of winter feeding and those of farms on which the winter feeding is appreciably better than the average. As the provision of reserves for the coming winter promises to be poorer than the normal one, which is harmfully scant, an acute position is likely to arise unless all possible remedial steps are taken. Frequently in January there is still time to make additional provision.

If favourable weather is experienced in time to allow of the preparatory cultivation which is advisable, a valuable measure is the sowing of temporary pasture, in the late summer or early autumn, on ground which, if not already broken out of grass would soon be so. A temporary mixture generally useful is to be expected from the sowing of 25 lb. to 30 lb. of Italian rye-grass and 6 lb. of red clover an acre. To ensure that temporary pastures provide a substantial amount of winter feed they must be sown early, and they generally can be depended upon for a heavy crop of hay in the next summer. If the temporary pasture is likely to have a life of less than a year and quick production of feed is especially desirable, then half of the Italian rye-grass may be replaced usefully by an equal amount of seed of Western Wolths rye-grass.

When the land to be used for late summer or autumn sowing is to be sown in spring in another crop it is likely to prove advisable to grow a fall-sown green-cereal catch-crop such as oats or barley, both of which usually give good results when sown at the rate of about 2½ bushels an acre. Such catch-crops, which under favourable circumstances give considerable feed in winter and early spring, may be followed by root or other suitable crops in the spring. Catch-crops after turnips or another cereal crop at times give quite good results when sown after relatively a very small amount of preparatory cultivation. Disking at times gives sufficient tilth for the seed-bed required. With such crops a dressing of superphosphate usually is profitable; as a rule 1 cwt. an acre may advantageously be used in districts of somewhat low rainfall, while 2 cwt. an acre may be well worth while in districts of good rainfall, if the response to phosphates is known to be high, and it frequently is. Such dressings of superphosphate as a rule increase not only the yield but also the rate of growth.

Often the fullest possible yields are not obtained from temporary pastures or cereals sown for winter feed because the crops are sown too late. This applies particularly in the South Island. Further, the likelihood of success with such crops is lessened if there has not been thorough preparatory cultivation. To give the mellow condition of the soil that results from aeration and weathering, if possible a month should elapse between the initial preparatory cultivation and the sowing. Against this is to be set the fact that the date of sowing is a critical matter; crops sown in January or February as a rule are much better for winter feed than ones sown in March, while crops sown in March may be expected to be appreciably superior to ones sown later.

Conclusive information about the varieties of cereals commonly used for green-feed purposes seems not to be available, but the following facts yield some guidance: Algerian oats, on the basis of field experience, has for many years continued decidedly popular; black skinless barley excels in the quick production of green-feed, but is likely to be otherwise inferior to Algerian oats. Cape barley also is marked by quick production of green-feed, but its tendency to become stemmy in late winter and early spring is a definite weakness in respect to the production of green-feed at that period.

General Cropping Work.

When the sowing of turnips and swedes has not been completed by the end of December, as a rule it should be carried out as speedily as possible. In most places after the middle of January it is better to sow turnips than swedes: turnips not only develop more quickly than swedes, but also suffer less from insect pests, which at times, and particularly in dry seasons, cause severe damage in late summer and autumn. Hardy Green Globe turnips are suitable for January sowing. Both turnips and swedes usually respond quite profitably to a dressing of fertilizer in which superphosphate is prominent.

Although generally the sowing of lucerne in November or December is preferable, it sometimes may be carried out with good results after mid-summer, but this, judging from field experience, is true only of districts in which the winter growth of plants in general is small. In districts characterized by mild winters, fall sowing of lucerne generally though not quite always has given unsatisfactory results; in such districts the cold of winter suffices to make lucerne dormant, but plants invading the lucerne, including rye-grass and common weeds, make enough growth through the winter to outgrow the lucerne-seedlings sufficiently to deprive them of the direct sunlight which is vital to them and without which they cannot compete successfully with the invading plants. If it is expected that there will be sufficient soil-moisture to allow of superphosphate exerting its fertilizing influence, then it is usually good practice to top-dress established lucerne about mid-summer with superphosphate just after it has been mown.

As a rule potatoes call for considerable work at this season. They should be kept free from weeds by suitable cultivation; possibly they should be sprayed preferably at such a date that the spraying will serve to prevent the establishment of blight in the crop rather than to check the spread of blight that has become established. Nevertheless, this latter benefit is often a very useful result of spraying which is likely to be not only more effective but also cheaper when the spraying-material used has been prepared suitably on the farm instead of purchased in a ready-made form. It is important to bear in mind that incorrect procedure in any particular may lead either to damage to the crop or to failure to control the blight. Full particulars about the preparation and application of sprays may be obtained from district officers of the Fields Division. At this season many potato crops will need to be moulded up. In districts in which the crops are likely to be subject to attacks of the potato-moth, moulding-up should be carried out with particular thoroughness as well-covered tubers are likely to escape damage by the moths.

As a rule the thinning of such crops as mangels and carrots should be carried out at this season—the Guerande carrot, because of its habit of growth normally does not need thinning. Any considerable delay in carrying out the thinning after the seedlings have become large enough to handle conveniently may bring about readily the permanent stunting of the plants.

In any year in which the supply of moisture in the soil is below what is needed to enable crops to make the greatest possible amount of growth, the summer tillage of crops which permit of it—*e.g.*, potatoes, mangels, &c.—is of paramount importance. A common cause of yields of crops being

greatly below the yields that otherwise would be obtained is an inadequate supply of moisture in the soil in summer. Surface tillage is of marked value as a means of checking loss of soil-moisture. Further, suitable tillage brings about aeration which leads to improved fertility. To farmers in general a splendid object-lesson in the value of summer tillage commonly is given by Asiatic market-gardeners in the Dominion, who so often may be seen diligently tilling their crops in summer even though weeds are not in evidence—a procedure which even in arid districts or seasons regularly gives them good crops.

Preparation for New Pastures.

One of the tasks of basic importance to be faced by many farmers during the next few months is the sowing of new pastures, which often clearly does not receive as much thought as it warrants. A vital aspect of the position is that many persevere with inferior pastures when the most profitable course would be to put such poorly productive grassland under cultivation with the ultimate objective of resowing to obtain a new, superior pasture in the establishment of which it would be possible to use the superior strains of rye-grass, clover, &c., which have been introduced to commerce during fairly recent years, and which enable high-class pastures of a permanent character to be obtained.

Really poor results in the establishment of pastures are far from uncommon. It is of much practical importance to bear in mind at this season that such poor results are generally due to one or more of the following causes: (1) Sowing on a poorly prepared seed-bed; (2) sowing at an unsuitable time of the year; (3) use of unsuitable seed. In the case of pastures sown in the fall of the year both sowing on a poorly prepared seed-bed and sowing at an unsuitable time of the year usually may be traced to starting preparatory cultivation at too late a date. Full success in the sowing of permanent pastures may be expected only when the seed-bed is in a fine firm condition: the use of loose lumpy seed-beds is certainly courting failure, which though it is unlikely to be complete, is very likely to be particularly costly in its influence on the returns over a series of years. For instance, loose lumpy seed-beds quite often are linked with failures of clovers, a poor development of which is not consistent with a vigorous highly nutritious and highly palatable pasture. To secure a desirable seed-bed the cultivation of land to be sown in permanent pasture in the fall now should be kept in mind. A short preparation of the seed-bed does not allow of the natural weathering of the soil which field practice has shown to play a valuable role in the economical production of a fine, firm seed-bed. If preparatory cultivation is not commenced early enough, a ready alternative to sowing on a poorly prepared seed-bed at the right time is sowing later on a well-prepared seed-bed. Fairly often the date of sowing of pastures in the autumn is too late. In many parts some danger attaches to sowing later than March. Undoubtedly sowings made later than March at times are quite successful, but in many districts in the majority of seasons such late sowings cannot be depended upon for good results. It seems to be widely known that clovers are likely to suffer in late sowings, but it probably is not so generally realized that the development of rye-grass and other plants is at times subject to such great checks as the result of late sowings that it becomes doubtful whether the new pasture ever attains the level of production that a suitably early sowing would give: apart from any damage by the clovers slow development of pasture-seedlings may readily give weeds a greater foothold than they could gain during the quicker development that early sowing with its greater soil-warmth brings about.

If pasture is to follow an arable crop it may quite well be sound practice, provided the land is reasonably clean, to disk rather than to plough: the firmness of the seed-bed given by the disking may be an advantage, and in disking any fertilizing-matter provided by animal manure is kept near

the surface where it is of most ready and effective benefit to the young pasture-plants. The value of firmness in the seed-beds for pastures is often demonstrated in the form of unusually good "strikes" where there has been exceptional consolidation—*e.g.*, in hoof-marks or in wheel-tracks or along headlands. Apart from the fact that firmness in the seed-bed seems to lead to vigorous root-development in pasture-plants, it is of major importance that there is less likelihood of seeds being covered too deeply in firm seed-beds: many of the pasture-seeds are so small that they can establish successfully only when lightly covered.

Top-dressing of Mown Grassland.

In those many districts which enjoy reasonably good summer rains and which have soils that ordinarily respond profitably to phosphates, an immediate and marked benefit may be expected from top-dressing with superphosphate any pastures from which hay or silage has been saved this year, unless such pastures recently have been top-dressed fairly liberally: it is usually preferable to apply the superphosphate as soon as the mown material has been removed. When pastures were mown at a leafy stage of development more vigorous aftermaths may be expected than from similar pastures mown at a later somewhat stemmy stage. But the aftermath while valuable as a source of leafy feed when such feed is likely to be in inadequate supply, especially on dairy-farms, is not always the sole immediate benefit of top-dressing in the way described: pastures mown at an over-mature stage may be somewhat weakened, and so may benefit greatly from the strengthening influence of the top-dressing.

Utilization of Special Summer Feed.

In dairying, any feed specially grown to supplement the pastures in summer should be fed as soon as the production of butterfat commences to drop at a rate greater than production drops in well-fed cows of reasonably good dairy character. When the yield of a herd is falling off at such a rate that the decrease in production in a month is about 9 per cent. of the yield of the previous month, then the rate of the decline in production may be looked upon as approximately normal—*e.g.*, a herd averaging 30 lb. of butterfat in a particular month may be expected to average 27·3 lb. in the following month if it is of satisfactory dairy type and efficiently fed.

As far as practicable young stock, such as calves, should receive feed supplying liberal amounts of the substances required for the formation of bone and muscular as distinct from fatty tissue. Stemmy pastures are deficient in such substances, and if young growing stock are forced to subsist mainly on feed from such pastures permanent stunting of the stock may result.

—R. P. Connell, Land Utilization Officer.

THE ORCHARD.

Cultivation and Cover Crops.

As the harvesting-season approaches growers may be considering easing up in the cultivation of the orchard. This may be advisable from some points of view, but before it is applied the soil should be brought to a good tilth. Even then a few strokes with the harrows, especially after summer showers, will prove beneficial, as this will help to retain the moisture already conserved in the soil. All trees in the orchard should be thoroughly hoed round, as this will destroy many of the breeding-places for pests and diseases. If the soil is left in good condition before cultivation ceases, the preparation of the land for the sowing of a green-crop early in January will be simplified. Blue lupin has been, and probably still is, the most favoured green-crop

for the orchard, although some growers, under the impression that their soil is " lupin-sick " after a few years of this crop, are reverting to oats and vetches, which is another good green-crop for the orchard. Climatic conditions in different districts have a bearing on the appropriate time for sowing a green-crop; but, if lupins are decided on, early January will generally be found the most suitable time for sowing. This will give plenty of time for the plants to grow and mature before ploughing under in the late autumn or early winter. Green-cropping is strongly advised where the soil is deficient in humus. Not only does a well-grown crop of lupins supply a large quantity of humus to the soil, but it is a means of adding nitrogen, so valuable in maintaining the general health of the tree. An application of superphosphate at the rate of from 1 cwt. to 1½ cwt. per acre is recommended when sowing the crop.

Thinning the Crop.

The natural drop of all varieties of fruit will be finished by the time these notes appear, and growers are reminded that, where only one thinning has been done, it may be necessary to go over the trees again, removing any fruits that are misshapen, diseased, or badly russeted, &c. This will allow the remaining fruits to develop properly, and thus reduce the quantity of small fruit to a minimum. It will also assist in the production of regular crops each year. All clustered fruit should be, in the majority of cases, reduced to two or three, and where heavy crops have set it often pays to reduce the bunches to individual fruits.

Pest and Disease Control.

The continuation of spraying, as recommended in previous notes in the *Journal*, should be attended to. Up to the present time growers have been favoured with a good spraying-season, and because of this some are apt to relax their efforts, with the result that pests and diseases become established. Reports from different fruit areas of the Dominion indicate that with the dry weather now being experienced red mite is on the increase. All growers are well aware of the great amount of injury that can be done by this pest, and every endeavour should be made to control it before the over-wintering eggs are deposited. By impairing the condition of the foliage, and thus reducing its functioning-powers, this pest can reduce the vitality of the tree to such an extent that the current season's crop will be seriously affected and buds for the following season considerably weakened. Although the regular applications of lime-sulphur should do much to keep this pest in check, if infection becomes serious it will be necessary to apply nicotine-sulphate, 40 per cent., at strength 1–800, either in combination with the sulphur sprays or alone. If used alone, the addition of soft-soap at the rate of 4 lb. per 100 gallons of spray is necessary to act as a spreader and sticker and increase the effectiveness of the spray.

Green aphis has become very troublesome on stone-fruits this season, possibly on account of the dry, warm conditions. Growers are advised to apply nicotine-sulphate (1–800) for its control. Usually one thorough application is sufficient; but it is advisable to give an extra spray six or seven days later in order to catch any of the aphis missed in the first spray. Stone-fruits should also receive regular applications of lime-sulphur at strength 1–180 for the prevention of brown-rot, leaf-rust, &c. The addition of 2 lb. of colloidal sulphur per 100 gallons will be found beneficial. These sprayings should be continued up to three weeks before harvesting the crop.

As the leaf-roller caterpillar is responsible for much damage to both foliage and fruit, especially where the thinning of fruit has not been sufficient to separate the clusters, a close watch should be kept for any signs of this pest, and lead-arsenate spray applied before the caterpillar has an opportunity of rolling the leaf. Once inside the rolled-up leaf it is almost impossible for the spray to reach the caterpillar.

Handling the Crop.

Early varieties of stone-fruits will be ready for harvesting during the month, and growers should see that everything connected with the handling of the fruit is ready, so that no time will be lost when picking commences. Stone-fruits require handling with the greatest care: they bruise easily, and any skin punctures may result in the entry of brown-rot. Fruit which has to travel any distance should be picked when firm. Proper grading is essential if the best prices are to be obtained. Only fruit of the same size, and the same degree of maturity, should be packed in the case. Pack the fruit carefully into clean cases and make it as attractive to the buyer as possible. Repeat orders are usually the result of quality combined with attractiveness.

The picking and packing of pip-fruits both for export and the local market will soon be under way, and growers will have very little time to spare for other matters. All fruit-cases should be made up and stacked in a convenient place; cases for export should be labelled; corrugated and wrapping paper placed in a handy position for the packers; rubber stamps and stencils should receive attention; in fact, everything done to ensure smooth working all through the harvesting-period. Another reminder is given to growers to thoroughly clean out the packing-shed, destroy old and dirty picking-cases and spray the whole with a solution of bluestone as recommended in the October notes. Reject fruit should not be allowed to lie in and around the packing-shed, but either given to the pigs or destroyed as soon as possible. In the orchard the necessity for care in handling a perishable article should be fully appreciated. Fruit for the local market should be allowed to remain on the trees longer than fruit intended for export to enable it to reach that stage of maturity most acceptable to the buyers.

—George Stratford, Orchard Instructor, Motueka.

Citrus Culture.

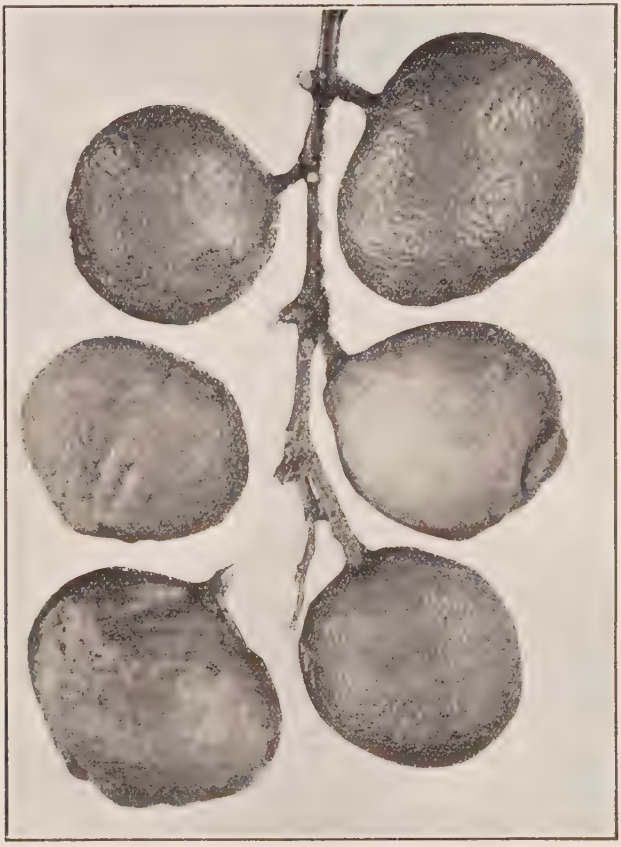
Citrus Thrips.—Characteristic symptoms of thrip infection on citrus trees is a silvering of the foliage—particularly the underside—and portions of the fruit. The appearance of injury caused to fruit early in the season changes as the season advances into rough scurfy areas. In cases of severe infection these areas will at times cover the greater portion of the fruit. Such blemishes lower the market value of the fruit appreciably and the injury to the foliage checks the general vigour of the trees. Long periods of low rainfall accompanied by high temperatures when occurring between January and May usually result in the rapid spread of the pest. Mandarin and orange trees are generally affected much more severely than lemon trees.

As mentioned in these notes for the previous month, control measures applied at the blossoming period are of doubtful value. In most seasons thrips cause no great amount of damage until late in January or later, consequently a close watch for infection should be kept at this period. Good control can be obtained by spraying at four-weekly intervals during the late summer and autumn with lime-sulphur (15 per cent. polysulphide content at a dilution of 1–45. It is important that the spraying should be done thoroughly, care being taken to direct the spray towards the underside of the foliage. Orange and mandarin trees in particular should be thinned by pruning where necessary to ensure the spray reaching all portions of the tree.

New Plantings.—If a prolonged spell of dry weather is experienced it may be necessary to water trees that were planted in the spring. In such cases sufficient water should be used at each application to allow of penetration to the deepest roots. Frequent light waterings are to be avoided as this practice tends to keep the soil cold and brings the rootlets too near to the soil surface.

Shoots arising from the trunks should be rubbed off as they appear and straggling shoot growth should be pinched back to enable the tree to develop a balanced head. Frequent attention to such matters in young trees often prevents the need for cutting out large limbs in later years.

Bud Selection.—Many orange and lemon trees in established orchards are consistently producing fruit of an inferior type, and these should be worked over with as little delay as possible with buds carefully selected from trees



INFERIOR TYPE OF EUREKA LEMON.

Trees producing such fruit should be worked over with buds taken from outstanding trees.

producing the best strain of the varieties to be worked. The Orchard Instructor for the district in which you are located will be pleased to advise you in connection with this matter and where suitable bud-wood may be obtained.

Insect Pests.—It is of the utmost importance that red scale (*Chrysomphalus aurantii*) infection should be reduced to an absolute minimum as early as possible. The scale not only causes tree debilitation, but it necessitates the scrubbing of infected fruits, which often results in injury to the skin, and subsequently in a high percentage of mould infection during the curing and marketing period. To ensure a satisfactory control by spraying with summer-oil, as recommended in these notes for the past month, it is essential

that the trees should be sufficiently open to permit of the spray penetrating to every part of the surface of the trees. Trees which are excessively dense in the heads should be thinned by pruning before the spray is applied. Special attention, in spraying for red scale, should be given to the uppermost and lower branches since these portions of the tree are most likely to be missed by the spray.

—*P. Everett, Orchard Instructor, Gisborne.*

POULTRY-KEEPING.

Feeding—*continued.*

IN last month's notes a popular method of feeding was given. The following are other rations which the writer has seen fed with success :—

No. 1.

Pollard	2 measures	Mixed with water.
Bran	1 measure	
Meat-meal	7½ per cent.	
Oyster-shell dust	1 per cent.	
Cod-liver oil	1 per cent.	
Chaffed greens	20 per cent.	

A light scratch feed of oats at noon, and wheat at night—about 1½ oz. per bird.

No. 2.

Pollard	8 measures	Mixed with water.
Bran	4 measures	
Oat pollard	1 measure	
Meat-meal	7½ to 10 per cent.	

Green food at noon, and a good feed of wheat at night.

No. 3.

Bran	8 measures	The salt was dissolved in the water with which the mash was mixed.
Wheat-meal	4 measures	
Meat-meal	1½ measures	
Salt	½ per cent.	

Equal parts of wheat, cracked maize, barley, and oats at night; green food after last feed at night.

No. 4.

Pollard	2 to 3 measures	Mixed with skim-milk; meat-meal was always before the birds.
Bran	1 measure	
Meat-meal	5 per cent.	

Green food at noon; grain at night, consisting of 3 measures of wheat and 1 each of barley and cracked maize.

Where birds were kept on the intensive system—that is, they were never out of the houses—the following rations were fed :—

No. 1.

Bran	4 measures	Half a measure of skim-milk powder was dissolved in the water with which the mash was mixed.
Oat pollard	1 measure	
Wheat-meal	1 measure	
Pea-meal	⅓ measure	
Meat-meal	¾ measure	

Wheat was fed at night, and chaffed green food given after the wheat.

No. 2.

Pollard	11 measures	The whole was mixed with skim-milk and as much given as the birds could clean up in about an hour.
Bran	4 measures	
Ground oats	1½ measures	
Wheat-meal	1½ measures	
Meat-meal	1 measure	
Chaffed greens	6 measures	

Wheat was fed at night—about 1½ oz. per bird.

Dry-feed mixtures, which were fed in hoppers and left before the birds for most of the day, were as follows :—

No. 1.

Pollard	100 lb.	Linseed-meal	3 lb.
Bran	30 lb.	Wheat-meal	15 lb.
Meat-meal	15 lb.	Salt	1 lb.

First thing in the morning the birds were given 1½ oz. each of wheat, and the same amount was given at night ; green food at noon.

No. 2.

Maize-meal	50 lb.	Skim-milk powder	4 lb.
Bran	16 lb.	Bone-flour	2 lb.
Pollard	16 lb.	Linseed-meal	4 lb.
Meat-meal	4 lb.	Salt	½ lb.

A light scratch feed of oats at noon ; wheat at night, and green food after the evening meal.

At one of our egg-laying tests where good results have been obtained the following is the system of feeding : A mash is fed in the morning, made up of 3 measures of pollard and 1 measure of bran. This is mixed to a crumbly state with liver soup. As much is given as the birds will clean up in half an hour. After feeding, the pens are inspected, and if some birds require more it is given to them. At noon a small quantity of boiled liver is given to each bird. Green food is also given, and on hot days extra green food is fed. At night a grain mixture made up of 3 measures of wheat and 1 of cracked maize is fed, and a 2-oz.-tobacco-tinful is given to each bird. Oyster-shell and metal grit are always before the birds.

At another large test a mash is fed in the morning, made up of 3½ measures of pollard, 1 of bran, 1 of chaffed green food, and ½ measure of ground oats, the whole moistened with skim-milk, and as much given as the birds will clean up. From the beginning of April about 5 per cent. of meat-meal is added, and is gradually increased up to 7½ per cent. About August this is gradually reduced, and from September until December only skim-milk is used as animal food, then meat-meal is again gradually added.

At noon chaffed green food is fed, and in the evening grain, consisting of 4 parts of wheat and 1 of oats. Oyster-shell grit and clean water are always before the birds.

Feeding-systems.

It may be said that there are two main systems of feeding, known as the moist- and the dry-mash systems.

The most popular system is to feed a moist mash in the morning and grain at night. However, as previously stated, experience has shown that it makes little or no difference whether the mash is fed in the morning or in the evening. It is really a matter of which is the most convenient for the poultry-keeper.

The other system is to feed a mixture of meals in a dry state, and place the mixture in hoppers so that the birds can please themselves. The chief advantage of the dry-mash system is that it reduces labour, and is especially

suitable for the poultry-keeper who has to leave for work early in the morning, and who has not the time to prepare a moist mash. It is a system that could be used to advantage on a general farm where the farmer and his wife are usually so busy first thing in the morning that often the fowls do not get fed until after the children go off to school.

Experience would indicate that better egg-returns are usually obtained when both moist and dry mashes are fed.

Some poultry-keepers claim that the dry mash encourages rats and is a more expensive system, and for these reasons, after a lengthy trial, they have gone back to the moist-mash method, while others still like the dry-mash method. Success depends largely upon attention to detail. When feeding dry mash it is advisable to see that ample feeding-space is provided for all birds at the hoppers, and also that more or less equal amounts of dry mash and grain are consumed. If too much mash and not sufficient grain is eaten, it is a good plan to close up the dry-mash hoppers for a couple of hours each day before feeding the grain.

The Art of Feeding.

The art of feeding is largely a question of common-sense and judgment. A few minutes devoted to watching the birds at feeding-time is time well spent. It is not advisable to rush through the pens, as some birds are highly-strung, nervy, and easily upset; in fact, as a rule the finer-bred a flock is the more highly-strung the birds are likely to be, and it is a great advantage to ensure that your birds have confidence in you.

Again, it is a good rule to feed according to appetite, and, as birds' appetites vary at times according to the weather, and especially when they are laying heavily or taking a rest, a little study of the birds while feeding will enable the beginner to feed more correctly.

Another point to remember is that it is really a waste to feed good expensive food and then compel birds to roost for long nights in damp, poorly-ventilated, or overcrowded houses. Healthy environment during hours of rest is a very important matter, for it is at that time that vitality is at a low ebb.

Regularity in Feeding.

Irregular feeding means irregular returns. Fowls are creatures of habit, and contentment is a big factor in good digestion, so care should be taken to see that feeding is carried out at regular times. If birds have to hang around the gate waiting to be fed, they get discontented and lose confidence in their owner. Where the poultry-keeper is unable owing to the nature of his work to feed at regular times, he would be wise to try the hopper method of feeding, but if he is irregular through being naturally unpunctual he would be well advised not to take up poultry-keeping as a means of a livelihood, because punctuality is one of the essentials to successful poultry-keeping.

A very important item is water. Nothing will check egg-production quicker than an irregular water-supply, and this is not difficult to account for when it is remembered that one dozen new-laid eggs contain just on one pound of water, and science tells us that 50 per cent. of a bird's live-weight, together with the food she eats, is made up of water. An experiment carried out at the Wallaceville Poultry Station showed that forty White Leghorn pullets when only a few were laying, consumed 3 quarts of water a day, but when they were all laying they consumed 6 quarts 3 ounces of water in a day. These points go to show how very essential a good, constant water-supply is for regular egg-production.

Exercise Important.

Vigour is likely to deteriorate if birds do not get sufficient physical exercise. The functions of the various organs are kept in good working-order by encouraging, or may it be said, forcing the fowls to take plenty

of exercise. The best way to do this, especially when they are kept on the intensive system, is to feed all grain in deep litter. Judgment is required to see that the litter is in good supply and dry. If the sheds are at all overcrowded or poorly ventilated, it is almost impossible to keep the litter dry. The floor of the house should be at least a few inches higher than the surrounding ground, and between 4 and 5 square feet floor-space should be allowed each bird.

The objective should be to encourage the layers to eat as much as possible, so the mash should be palatable, and all feed-troughs, &c., kept clean and sweet.

If a change has to be made, it should be made gradually.

—C. J. C. Cussen, Chief Poultry Instructor, Wellington.

THE APIARY.

Returning Swarms to Parent Hives.

Swarms in January are of little value except as increase for the next season, and should be returned to the hives whence they originated if these can be traced. It is a good plan to kill the old queen in the swarm when returning it, at the same time destroying all but two queen-cells in the parent colony. If the hive is cramped an extra super may be given, and with this inducement the colony will usually settle down at once to work.

After-swarms should always be returned to the parent hive. They are easily disposed of even if the beekeeper does not know whence they came. If they are shaken through an excluder into an empty super the virgin queen or queens can easily be picked out as they attempt to force their way through, and once these are removed the bees will return to their old home. The young queens can then be used to replace poor queens in the apiary. It is an excellent plan to have one or two queen-cages always on hand. The young queens can each be confined in a separate cage, and when the queen to be destroyed is removed the closed cage containing the virgin can be placed on top of the frames and left there for twenty-four hours, during which time she will be fed by the bees in the hive. At the end of twenty-four hours she can be released and allowed to run down into the frames, when she will be accepted by the bees.

Ventilation.

The matter of ventilating the hives should by now be receiving every attention. Every means should be used to ensure the bees having an abundance of fresh air day and night. All weeds and other obstructions should be removed from the fronts of the hives, and the entrances enlarged as much as possible. In extreme cases the hive-bodies should be raised from the bottom-boards by means of small blocks of wood. On no account should the bees be allowed to cluster outside the hives, and wherever they show a tendency to excessive fanning steps should be at once taken to increase the supply of fresh air to the colonies.

Efficient use of Supers.

One of the necessities of a well-regulated apiary is an abundance of supers when the honey-flow is in full swing. Every inducement should be given the bees during the often brief season to gather in every available drop of nectar. No beekeeper with business acumen will allow his bees to loaf or cluster outside the hives for lack of storage room. It is well when adding extra supers to place them between the brood-chamber and the first super, or at least to raise a few frames of honey from the first super into the second when adding the latter.

It should be understood, however, that supering must not be overdone and the bees disheartened by being given too much work at one time. On no account add a second super until the bees are well at work in the first, and in cases where the colonies are only building up well at the beginning of the honey-flow—that is, where a poor colony has been requeened and the new queen's brood has not as yet hatched—it is an excellent plan to tier up with half-stories. Many an apiarist has had a moderate return from a small colony with half-stories, when it is doubtful if any return at all would have been obtained by the use of full-depth supers.

Queen-excluders.

January is the month when queen-excluders are of most use, especially in southern districts. Whatever their disadvantage may be in some localities, in the south they have proved their efficacy in enabling extracting to be finished before the hot weather goes, without the destruction of any brood whatever. Excluders should never be used for general purposes until the main honey-flow is in full swing. By that time the bees are used to working in the supers, and, with nectar in abundance to be had all around them, they will work cheerfully right through the hive, passing through the holes in the excluders as if no obstruction existed.

The best method of using the excluders is as follows: All sealed brood should be raised above the excluder, and the queens confined below on drawn-out combs. The brood above the excluder should be watched for a few days in case any eggs have been elevated, as the bees will sometimes attempt to raise queen-cells above the excluder. If this happens the queen-cells should be destroyed, as the queens which would emerge from them would not be able to pass through the excluders to get mated, and would in time develop into drone-layers. By providing the queen with plenty of empty combs she will be able to cultivate laying at a sufficient rate to keep up a supply of workers, and as the brood hatches out in the upper stories the cells will be at once filled up with honey.

Excluders are often condemned as being productive of over-swarming, but in many localities swarming ceases automatically as soon as the main honey-flow commences, and if the queen is allowed plenty of room in the brood-chamber, and the brood in the supers carefully watched for the production of queen-cells, very little harm can come from the use of excluders, while the immense advantage of being able to extract combs entirely free of brood is worth a great deal to the apiarist at his busiest season.

Foul-brood and its Treatment.

Foul-brood, unfortunately, is all too common in some localities, and in consequence beekeepers may at any time have a visitation. No one, however, should look upon foul-brood as a necessary evil: it can be cured. It is unknown in some parts of New Zealand, some apiarists who have been keeping bees for ten years or more never having seen it. Other districts that have in the past been troubled with the disease are now free from any sign of infection.

There is therefore no excuse for the presence of foul-brood in apiaries situated in open country: its presence is explained by carelessness on the part of the beekeeper. There is no remedy for American foul-brood superior to the McEvoy treatment, which has been frequently described in the *Journal*, and is more fully dealt with in the Department's Bulletin No. 119, "American Foul-brood in Bees, and its Treatment," which can be obtained free on application. Carelessness in dealing with foul-brood must result in heavy losses, and eventually in the destruction of the whole apiary. Make a point of treating any colonies found to be infected; though there may be only a few cells of disease showing, the infection is there, and it is

not safe to trust to any methods less than the full McEvoy treatment. On no account put supers on infected colonies; this will only increase the quantity of material that must eventually be destroyed to ensure the eradication of the disease.

—E. A. Earp, Senior Apiary Instructor, Wellington.

HORTICULTURE.

Vegetable Crops.

THE climatic advantages of warm districts for growing these crops are generally recognized, and in the production of early crops they are sometimes very considerable. For many of the main crops and winter crops, however, they are often at a distinct disadvantage. Some of these thrive best in a cool district, and under such conditions insect pests are not so prevalent. In such localities certified seed potatoes may often be grown: swedes and late peas are superior, as also are choice savoy cabbage, cauliflowers, and broccoli. Good brussels sprouts can be grown only in the cooler districts. Selected areas on farms are sometimes leased for this class of cropping, and after three years are handed back, sown down in grass and grazed for a similar period before cropping again. The demonstration has been very instructive to those engaged in mixed farming, and such farmers are taking advantage of the excellent prospects thus opened up. The rest afforded by this class of rotation gets rid of many of the pests and diseases affecting these crops, and intensive grazing is probably the best way of building up fertility again under modern conditions. Combined with the liberal use of fertilizers, this method is probably the most economical way of producing crops of the standard hardy vegetables. In fact, in the warmer districts where early crops are grown and followed up by half-hardy summer crops, a rotation along these lines is best, when supplies of stable or farm manure are not available for maintaining the necessary supply of humus in the soil. The alternative in such a case is to sow down the greater part of the area in oats and horse-beans, &c., in the autumn and grow a heavy green crop for turning under. For this class of cropping fairly light land is required, and the maintenance of a sufficient supply of humus in the soil is the crucial problem under present conditions.

Planting winter crops of celery, leeks, savoys, and red cabbage, cauliflower, broccoli, brussels sprouts, and kale should now be completed. Clean strong plants set out in land that is well prepared can generally be relied upon to give a good crop. Weak, blind plants should be avoided; and a sharp look-out for any sign of club-root should be kept when dealing with those of the cabbage family. Aphides, and caterpillar larvæ of the diamond-back moth, and white butterfly are persistent enemies of plants of that class at the present time. The attack is less severe as soon as autumn rains and temperatures are experienced. Nicotine sulphate and arsenate of lead have been used with some success for protecting crops from these attacks. If, when the plants are lifted, the tops are dipped in this mixture and allowed to dry off before planting, it will destroy these pests; but for further protection something less volatile than nicotine and less poisonous than arsenate of lead should be used. We now have an excellent remedy in derris. If a good brand of dust is used after planting out at intervals as required, these pests will do little damage. A dust-gun of modern design costs but a few shillings, and with it the dust may be applied economically, efficiently, and with little labour. As a protection from the attack of leaf-spot fungus on celery-plants, a thorough application of Burgundy mixture should be applied just before lifting and planting out.

On light land in cold districts "early" potatoes are sometimes planted late and left in the ground during the winter and lifted as required. In warmer districts, however, where they are now maturing, they should be lifted as soon as they commence to ripen and before the plants die down. Except in the driest districts, crops of late potatoes should now be sprayed with summer strength Bordeaux to protect them from the attack of late blight, and the application repeated at intervals of three or four weeks or as long as may be necessary.

Crops of autumn-sown onions, shallots, and garlic ripen during the month of January. They should then be lifted and thoroughly cured. If the weather is unsettled this is best done under cover; but in any case they should be given good dry storage for a few weeks to thoroughly harden off the bulbs before cleaning and grading.

The leading growth of such crops as pumpkins, marrows, &c., should now be stopped by removing the tips of the leaders with a view to encouraging fruitful lateral growth. Careful attention will be required in supplying water to the celery crop. It is sometimes overdone: much depends on the subsoil and drainage; also the nature of the topsoil and the fertilizers and manures used. Anything like a water-logged condition should be carefully avoided. Spent crops must be cleared promptly. Delay affords a risk of perpetuating disease and exhausts the soil unnecessarily.

Tomato crops under glass will require attention in feeding, watering, and ventilation to fill out the top fruit. Where seeds are being sown for a winter crop to follow on, arrangements should be made for thoroughly disinfecting the house before planting the new crop. The establishment of the tomato-mite pest, *Phyllocoptes* sp., in the Auckland District (fully described in the July number of the *Journal* by Cottier and Taylor), appears to have been often largely due to neglecting to clear the old crop promptly as soon as the fruit was gathered and thoroughly cleansing the house. For the control of these mites on the growing crop, also aphides and white-fly, fumigation with nicotine sulphate 1 fluid ounce to each thousand cubic feet of house should be used during a calm evening more frequently. Where houses are insufficiently gas-tight for fumigation in this way, spraying with nicotine sulphate may be adopted, mixing one pint in 100 gallons of water in which 3 lb. or 4 lb. of soap have been dissolved.

The outside tomato crop in most instances commences to ripen towards the end of January, and when the soil is in nice condition after rain a side dressing of fertilizers will often be of assistance to the plants. Study the crop well and apply a mixture which will best adjust any undesirable bias which may be present as well as stimulate the plants to enable them to mature the crop well. Clean picking is important, as with any other fruit crop—that is to say, all mature fruit should be gathered at one picking; any overlooked are wasted and encourage attack from birds, or, if gathered later, often lead to a pack of mixed maturity being made, which is unsatisfactory to the buyer.

Sowings of peas and dwarf beans are now sometimes made, but it requires a warm climate to finish them well. Shorthorn carrots and globe beet, silver beet, spinach, and salads may be sown. In the cooler districts spring cabbage is sown towards the end of January, but the following month is otherwise soon enough.

Small and Sundry Fruits.

The crops of hardy small fruits are now being harvested. As soon as they are finished plantations of black currants, raspberries, and loganberries, which carried the crop on the young wood, should then have that

wood cut out, including weak growths, carefully gathered up, carried out, and burnt. Cut well back to the surface of the ground, or, in the case of currants, to just beyond a bud well down on the branch. The new growth of loganberries running over the surface of the ground is usually best left there until growth commences in the spring, when it may be trained in on the trellis and the ground cleared for the growth of another season. Strawberry-beds which are exhausted should be grubbed out and burnt without delay, and the land prepared for another crop. Where the beds are to be carried on for another season they are cleared of runners, mulch, and weeds; given a dressing of such manures as they require, and light cultivation to build up constitution for the next crop.

The new canes of raspberries and loganberries are now liable to be attacked by the caterpillar larvæ of a native moth known as *Carposina adreptella*, which eats out the buds. They should therefore be protected by applications of arsenate of lead until the month of March, when egg-laying probably ceases. Without this protection the attack often causes serious damage. The article in the October number of the *Journal* by Muggeridge and Cottier, on the black-currant-bud eelworm should be carefully studied and the suggestions under the heading of "general hygienic measures" of control put into practice. The plants should be closely examined in dry weather, and all infected material cut out and burnt. Where infected bushes are found the ammonia-solution spray should be given a trial experimentally. It is made of ordinary ammonia 3 parts to 100 parts of water. When cuttings are made later it is, of course, important to see that all propagating-material is definitely free from this pest, and is kept from any contact with plants or land which may be infected.

Where land has to be prepared for autumn or winter planting of small-fruit, it should now be fallowed to thoroughly clean up all bad weeds, and it is advisable to work in such manures and fertilizers as may be necessary to put it in good heart. In the warmer districts strawberry-plants are set out so late as the month of April, but in most districts they are best planted as soon as the young plants are available, so that they may become established before the cold weather. Where plants of these or other kinds have to be purchased, the stocks should be carefully examined now and suitable material ordered for delivery as soon as it is ready for removal. Plants should be sturdy, but not over-sized and soft, well-rooted, clean, and true to name. The temptation to purchase cheap material should be dealt with cautiously. Unless the plants are sound and the ground thoroughly clean, planting should be deferred to another season. Most of these crops thrive best in the cooler districts, with a good rainfall, unless irrigation can be done.

The Homestead Garden.

The pleasure in a garden is often discounted by the heavy demand or cost of labour in maintenance, and to avoid this difficulty care should be taken now when designing new gardens or alterations to old ones. Maintenance is greatly facilitated if the design is simple in outline and the lawn is not overcrowded with isolated specimens of trees, shrubs, and flower-beds. A little planting on a lawn is often desirable to avoid monotony and give variety. The outstanding position is suitable for displaying a handsome tree which will also afford shade or shelter, or for a bed of flowering plants that is given special attention; but great restraint is necessary both to obtain the best effect as well as to make maintenance easy. Where a mistake of this kind has been made in an established garden, beds may be levelled and turfed down during the autumn, superfluous trees and shrubs removed,

and the site consolidated and turfed over. When of moderate size and lifted with care, shrubs may be replanted in a group on the lawn or elsewhere quite successfully. Banks or terraces of any size or if at all steep may be planted closely with shrubs and possibly trees ; or a dry stone wall may be built, thus dispensing with the grassed face altogether.

Where small paddocks in the vicinity of the homestead may be broken up in rotation for cropping with roots and vegetables by means of horse-drawn implements, the ordinary kitchen garden can be dispensed with, merely retaining an enclosed area for small-fruits and such perennial crops as asparagas, rhubarb, and herbs, also salad crops—an area which will require comparatively little labour, and that of the lightest kind, to maintain it in good condition. With a cool dark shed, well ventilated, and a concrete floor to enable it to be kept clean, potatoes, roots, hard fruits, such as apples, &c., may be kept in good condition for a maximum period with a minimum of loss. Such produce as pumpkins and onions will require the drier position. In these and other ways great economies in labour and produce may be made on many farms.

Not the least important feature in the homestead garden is the lawns ; a thick sward, clean, fine, and of good colour is a necessary setting for the best results. Where the land is moist, well drained, and of good quality, there is little trouble in obtaining a high standard in this respect. Otherwise more attention is required ; but it is an interesting problem for one who has much to do with the management of pastures. The treatment of lawns then takes on something in the nature of experimental plots from which much may be learned regarding local reactions, some of which may have an application to the bigger problems on the farm. The main difference between lawns and pastures is that the former are not grazed, and therefore do not receive the manurial dressings the pastures get. Unless the conditions are of the best, the soil fertility soon shows signs of depreciation and the turf becomes open and weedy, especially where close cutting and hard wear takes place. It is then necessary, as with other crops, to practise feeding to maintain a high standard of growth. This usually takes the form of small periodical dressings of fertilizers, and, in the case of light land, an occasional dressing of a compost rich in humus. Where attention of this kind may be necessary, and in the absence of a good local practice to the contrary, the following mixture may be applied towards the end of January at a rate of 1 oz. per square yard, which is equal to about 300 lb. per acre : 3 parts superphosphate and 4 parts nitrate of soda. The materials should be well mixed, and if a quantity of dry light-screened loam is included it will often facilitate an even distribution being made. It should be applied after rain when the grass is dry.

Where black wattle and eucalypts are grown for shelter and firewood, cutting demands careful consideration. It has been stated that black wattle cut in summer will renew itself very effectively. Eucalypts also will make good second growth, which is useful for shelter and other purposes, if they are properly cut at the right season : this has been stated to be the late winter for preference. It is possible these reactions may vary in different localities, and these treatments require a trial under various local conditions. In most instances it is probable that late in the months of January and July would generally be most suitable for cutting these trees, and they should be sawn off about level with the ground so that new growths will get support and will not readily be blown out.

—Wm. C. Hyde, Horticulturist, Wellington.

ESTIMATED AREAS UNDER WHEAT, OATS, BARLEY, AND POTATOES (SEASON 1937–38).

As in previous years, cards were sent out by post to grain-growers and to potato-growers throughout the Dominion asking them to state what areas they had sown or planted, or intended to sow or plant, in wheat, oats, barley, and potatoes this season. It may be well to note that only holdings of 1 acre and over outside borough boundaries are covered by the figures appearing below. In the case of potatoes a fair amount is undoubtedly grown on the smaller holdings and on holdings situated within boroughs.

WHEAT, OATS, AND BARLEY.—FINAL AREAS, 1936–37, AND AREAS ESTIMATED AS SOWN OR TO BE SOWN IN 1937–38.

	Wheat.	Oats.	Barley.
Areas, 1936–37:—	Acres.	Acres.	Acres.
For threshing	221,790	74,772	20,544
For chaffing	1,400	187,694	694
Total harvested	223,190	262,466	21,238
Not harvested (fed off, &c.) ..	1,447	53,238	4,274
Grand totals	224,637	315,704	25,512
Areas, 1937–38 (estimated):—			
North Island	3,300	16,500	3,200
South Island	184,700	269,100	27,300
Totals	188,000	285,600	30,500

Particulars as to varieties of wheat and oats sown or intended to be sown were asked for. The following table gives a summary of results in cases where varieties were specified:—

	Wheat.				Oats.				
	Tuscan or Longberry.	Hunters (Varieties).	Velvet or Pearl.	Total Specified Varieties.	White.	Dun.	Black.	Algerian	Total Specified Varieties.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
North Island	930	599	528	2,057	902	62	86	5,476	6,526
Nelson, Marlborough, and Westland	2,469	1,371	437	4,277	294	273	123	6,939	7,629
Canterbury	102,566	23,978	3,366	129,910	50,185	12,277	4,801	44,420	111,683
Otago and Southland ..	9,633	5,429	653	15,715	52,664	3,166	2,838	5,322	63,990
Dominion totals ..	115,598	31,377	4,984	151,959	104,045	15,778	7,848	62,157	189,828

Tabulation of statistics for potatoes gives the following results:—

POTATOES.—FINAL AREA, 1936–37, AND AREA ESTIMATED AS PLANTED OR TO BE PLANTED, 1937–38.

	Final Area, 1936–37. Acres.	Estimated Area, 1937–38. Acres.
North Island	5,812	4,900
South Island	16,650	16,800
Totals for Dominion ..	22,462	21,700

—Government Statistician.

WEATHER RECORDS: NOVEMBER, 1937.

Dominion Meteorological Office.

NOTES FOR NOVEMBER.

In most districts November proved a favourable spring month, although the first half was extremely dry and, following a lengthy spell of equally dry conditions, during this period there was a shortage of feed in many parts of the country, and the general outlook for the farming community appeared to be very serious. Between the 15th and 25th, however, beneficial rains occurred at times over the greater portion of the Dominion, and pastures and vegetation revived. In parts of South Canterbury, Otago, and Marlborough, however, the rainfall was not sufficient to relieve the situation, and in these areas food for stock is still short and many crops have been seriously affected. The North Island, on the other hand, with the exception of the Manawatu district, experienced favourable conditions, with the result that feed is now plentiful. On the whole, stock are in good condition and the season has been excellent for the fattening of lambs.

Rainfall.—Over most of the northern half of the North Island the month's aggregate rainfall was above the average, the greatest departure being in North Auckland. The whole of the remainder of the Dominion experienced a deficit, places in the eastern and southern areas of the South Island having less than half the November average.

Temperatures.—Temperatures were everywhere above normal, the departure averaging 2° F. in both Islands. Some days were very warm, but, on the other hand, there were several nights when frosts were severe enough to cause damage to fruit trees and vegetables, more especially at inland places in the South Island.

Sunshine.—The amount of bright sunshine recorded nearly everywhere exceeded the average, the only reporting stations having a deficiency being Nelson and Waimate. Blenheim had 259·7 and Napier 251·8 hours.

Pressure Systems.—During the first week the weather was fine, almost generally under the influence of a rather intense anticyclone, the centre of which moved to the east of the North Island on the 8th. By the 9th a shallow depression had advanced on to the Dominion and fairly general, though mostly light, rains occurred during the night. Rain also fell over most of the North Island between the 11th and 14th associated with a cyclonic depression which crossed northern New Zealand on the latter day. Up to this time rainfall had not been widespread, and the South Island especially had continued to experience dry conditions.

By the 16th, however, an extensive westerly depression had moved on to New Zealand and general beneficial rains accompanied it about this time. A series of similar depressions continued to cross the Dominion until the 19th, and strong and squally winds between north-west and south-west prevailed, with changeable conditions and rain at times in most parts of the country. Thunderstorms were also frequent during this period, particularly severe ones occurring on the 17th in the Waikato district, and on the 19th in parts of Taranaki and Wellington provinces.

The final storm system of the month was a combination of a cyclone in the north and a westerly depression in the south, both of which crossed the Dominion during the night of the 24th. This disturbance deepened considerably in passing to the east, and consequently, during the night of the 24th and on the 25th, strong southerly winds to gales prevailed, accompanied by heavy showers and, in places, thunder and hail. Particularly heavy rains occurred in the Auckland province, and a severe thunderstorm was experienced in parts of the Gisborne district. This was the only really cold snap during the month, and, fortunately, it was of brief duration. On the 26th anticyclonic conditions with fine weather set in and continued to the close of the month.

RAINFALLS FOR NOVEMBER, 1937.

Station.	Total Fall.	Wet Days.	Maximum Fall.	Average November Fall.	Total Fall to date.	Average Fall to date.
North Island.						
	Inches.		Inches.	Inches.	inches.	Inches.
Kaitaia	4·39	11	1·40	2·75	55·11	51·68
Russell	5·51	8	1·94	3·19	91·98	54·86
Whangarei	4·68	12	1·04	2·81	79·01	57·52
Auckland	3·18	10	1·20	3·59	41·29	46·17
Hamilton	3·00	11	1·74	4·01	35·92	46·04
Rotorua	4·41	11	1·42	4·18	45·12	51·25
Kawhia	..	..	..	4·52	..	50·42
New Plymouth ..	2·90	14	1·13	4·70	50·96	55·49
Riversdale, Inglewood ..	6·15	17	1·71	9·12	80·83	96·69
Whangamomona ..	..	..	..	7·39	..	71·92
Hawera	2·85	10	0·74	3·78	36·15	41·96
Tairua	4·21	8	1·45	3·63	60·86	60·07
Tauranga	3·79	10	1·53	3·29	50·98	48·81
Maraehako Station, Opotiki	4·17	10	1·49	3·16	55·99	50·45
Gisborne	2·52	9	1·01	2·88	37·69	42·83
Taupo	2·67	10	1·56	3·32	29·87	40·75
Napier	1·26	7	0·68	2·02	23·44	28·14
Hastings	1·60	7	0·68	1·82	19·67	29·98
Taihape	..	..	..	3·40	..	33·46
Masterton	1·66	11	0·59	2·69	29·65	35·47
Patea	3·64	10	0·96	4·01	38·14	41·29
Wanganui	1·97	8	0·93	3·24	27·56	33·42
Foxton	1·66	9	0·50	3·20	20·61	29·87
Wellington	2·90	9	1·31	2·99	30·97	39·37
South Island.						
Westport	7·11	10	2·05	8·85	71·36	88·35
Greymouth	8·48	17	2·22	9·10	85·79	92·90
Hokitika	9·11	15	..	10·45	92·56	104·37
Ross	8·91	14	2·89	13·86	113·02	123·44
Arthur's Pass ..	..	..	..	16·11	..	147·80
Okuru, South Westland	8·78	7	2·60	12·60	125·25	133·50
Collingwood	4·73	8	2·29	6·90	68·48	89·19
Nelson	2·65	7	0·99	2·92	28·15	34·86
Spring Creek, Blenheim	1·85	6	0·80	23·9	22·26	28·18
Seddon	1·14	5	0·56	1·85	21·41	22·84
Hanmer Springs ..	1·17	10	0·25	3·46	29·78	41·29
Highfield, Waiau ..	1·03	7	0·35	2·52	20·10	30·64
Gore Bay	1·96	7	0·64	2·12	27·97	28·70
Christchurch	0·88	9	0·31	1·78	19·46	22·67
Timaru	0·73	5	0·38	1·95	17·09	20·26
Lambrook Station, Fairlie	1·09	5	0·39	1·93	15·74	22·30
Benmore Station, Clearburn	0·47	6	0·23	2·05	20·45	22·30
Oamaru	0·46	5	0·29	1·92	13·68	19·76
Queenstown	0·33	4	0·14	2·71	21·71	27·99
Clyde	0·58	3	0·33	1·34	12·26	13·46
Dunedin	1·14	7	0·36	3·21	34·19	33·18
Wendon	1·55	9	0·49	2·72	35·19	27·14
Balclutha	1·20	6	0·43	2·48	27·86	23·06
Invercargill	2·61	17	1·00	4·28	36·77	41·65
Puysegur Point ..	6·27	22	1·61	8·25	76·11	78·09
Half-moon Bay ..	3·04	16	0·78	5·79	51·11	53·89